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NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) RECONNAISSANCE AND DECONTAMINATION OPERATIONS

PREFACE

This manual describes how NBC units operate on the modern battlefield. NBC units perform two basic tasks. First, they conduct NBC reconnaissance operations to locate contaminated areas and to find suitable decontamination sites. Second, they conduct decontamination operations to lessen the effects of NBC attacks.

NBC reconnaissance and decontamination units and NBC elements are assigned to separate brigades, armored cavalry regiments, divisions, and corps. Tables of Organization and Equipment (TOE) 3-87 and 3-500 list manpower and equipment authorizations for NBC units. However, all Army units are organized under Modification Tables of Organization and Equipment (MTOE). Thus, to determine specific authorizations, refer to the MTOE of the unit.

NBC reconnaissance teams currently operate from 1/4-ton trucks with pedestal-mounted machineguns. These trucks will soon be replaced with armored personnel carriers. When equipped with armored personnel carriers, NBC units will operate essentially the same as they do with 1/4-ton trucks. The carrier, of course, provides better protection.

Comments and suggestions on how to improve this "how-to-fight" manual should be sent to the Commander, US Army Chemical School, ATTN: ATZN-CM-TD, Ft McClellan, Alabama, 36205.

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NUCLEAR, BIOLOGICAL, AND CHEMICAL (NBC) RECONNAISSANCE AND DECONTAMINATION OPERATIONS

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When used in this publication, "he," "him," "his," and "men" represent both the masculine and feminine genders.

CHAPTER 1

THE MODERN BATTLEFIELD

INTRODUCTION

Armies are now able to locate and destroy each other better than ever before. During the past several decades, the nature of battle has changed—not abruptly, but nonetheless significantly. The development and production of weapons of massive destruction during the past 30 years have significantly changed the complexion of the modern battlefield. Included in this inventory are nuclear, biological, and chemical (NBC) weapons. The employment of these lethal weapons by both sides shows how war will be fought in the future.

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CHARACTERISTICS OF THE NEXT WAR

The next war will be characterized by the following:

- **Distance.** New weapons have greater range and lethality than old weapons. As a result, rear areas are no longer safe.
- **Intensity.** Numerous short and intense battles will lead to losses of men and material never before experienced.
- **Flexibility.** The wide range of weapons lethality and the ability to select the amount of destruction have given the commander unprecedented flexibility.
- **Contamination.** All NBC weapons have residual contamination effects that present a hazard to both friendly and enemy forces.
- **Proliferation.** The major powers have developed and fielded an unprecedented array of sophisticated weapons which include nuclear, chemical, and perhaps biological weapons.
- **Concentration.** High mobility (brought about by the large numbers of armored, mechanized, and airmobile forces) enables rapid troop concentrations. While concentration is necessary, it provides a lucrative target for highly lethal weapons.
- **Complexity.** The number of sophisticated systems that must be brought together to achieve the full measure of combat power has tremendously increased the complexity of battle.

The primary objective of the US Army is to win the first and succeeding battles of the next war. To accomplish this objective, US forces must be able to conduct successful operations in widely varying environments. These include environments contaminated by nuclear, biological, and chemical weapons. To win the land battle in a contaminated environment, units must defend against NBC attacks. They must also employ NBC units to reduce the effects of these attacks.

The use of NBC weapons against an enemy who is poorly trained and ill equipped with

NBC defensive equipment can greatly change the outcome of the battle.

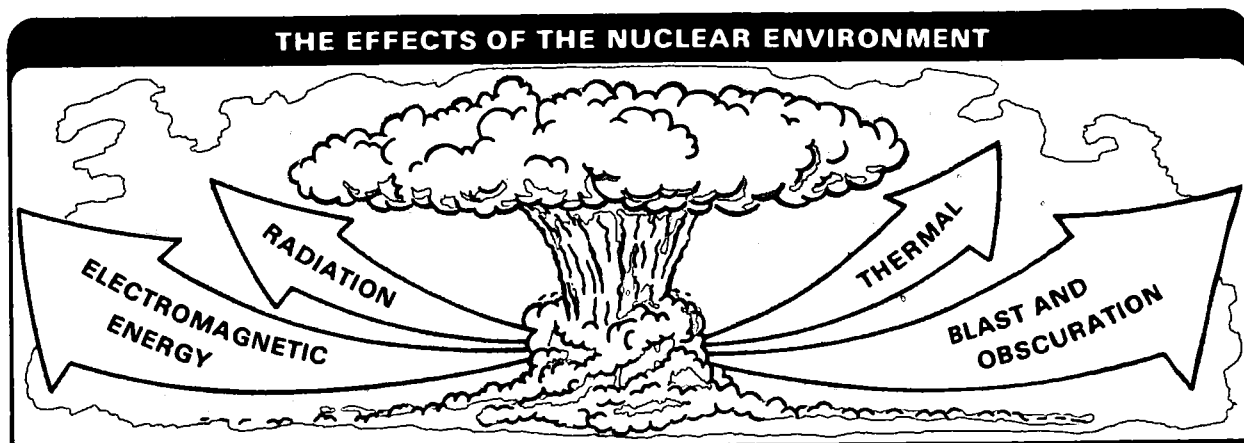
The objectives of NBC defense are to—

- **Deter NBC attacks.**
- **Survive NBC attacks if deterrence fails.**
- **Conduct sustained combat operations under NBC conditions.**

THE NUCLEAR ENVIRONMENT

With the advance of nuclear technology, many armies are now, or soon will be, able to employ nuclear weapons. The US Army must be prepared to fight and win when nuclear weapons are used. In addition to blast effects, thermal and nuclear radiation pose significant hazards that must be reduced in order to win the land battle. Equipment will be crushed, dragged, and tumbled by blast. Dirt and dust, accompanying the blast wave, will obscure both optical-sighting devices and unaided vision. The blast effect can also

restrict maneuver by blowing trees and buildings down. Personnel can suffer internal injury from both blast overpressure and nuclear radiation. They can suffer external injury from flying debris and burns from thermal radiation. In addition, electromagnetic energy, generated by nuclear weapons, can temporarily black out radio communications and permanently damage electronics in communication equipment.



THREAT NUCLEAR OPERATIONS

It is true that the decision to initiate tactical nuclear war is a political one. However, Threat doctrine emphasizes the normal use of nuclear weapons and the importance of achieving surprise in an initial nuclear attack. Also stressed is the necessity to mass

nuclear fires throughout the depth of the enemy defenses, along the line of the main thrust. The front commander may be given the authority to respond to an enemy's first use of nuclear weapons by employing nuclear weapons himself.

Nuclear Fire Planning

During nonnuclear combat, fire plans of Threat divisions and higher echelons include plans for nuclear strikes. In addition to large caliber artillery weapons capable of firing nuclear ammunition, Threat forces stock nuclear warheads for surface-to-surface missiles. They also have frontline air squadrons specifically designated for the

ground support role. In nuclear warfare, mass nuclear strikes are carefully planned for breakthrough, deliberate attack, and river crossing operations. In meeting engagements and exploitations, some nuclear delivery systems are kept in a high state of readiness to fire on targets of opportunity.

Threat nuclear target priorities during offensive operations are said to be—

- Enemy nuclear delivery means.
- Division and higher unit headquarters.
- Special ammunition supply points.
- Communication centers.
- Reserves and large troop concentrations.
- Known defensive positions.

In the defense, Threat nuclear fires are primarily used to—

- Destroy enemy nuclear delivery means.
- Halt an offensive thrust.
- Seize the initiative in order to regain the offense.
- Counter enemy preparations.
- Support counterattacks.
- Eliminate penetrations.
- Deny areas to the enemy by use of fallout from surface burst weapons.

Nuclear Weapon Effects

THREAT DOCTRINE STRESSES AIR BURSTS TO MAXIMIZE THE EFFECTS OF NUCLEAR WEAPONS

As a general rule, Threat tactical nuclear weapons are of larger yields than those of friendly forces. Employment techniques stress air bursts to maximize effects—blast and nuclear and thermal radiation.

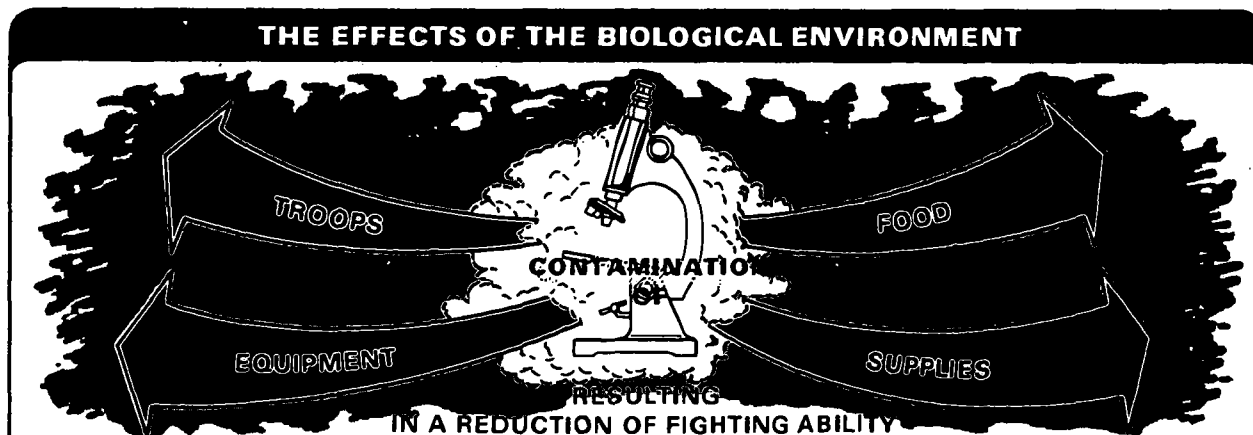
The vulnerability of friendly forces to enemy nuclear strikes can be estimated using the 101-31 series field manuals. As described in chapter 2, the NBC element performs nuclear vulnerability analyses so that commanders have current data from which to assess the nuclear threat.

THE BIOLOGICAL ENVIRONMENT

Biological weapons are used in military operations to cause disease among soldiers, animals, and plants. Although these agents act on different targets and produce varying effects, the ultimate aim of biological agents is to reduce fighting ability.

BIOLOGICAL AGENTS HAVE THE POTENTIAL OF CONTAMINATING AN AREA LARGER THAN ALL OTHER NBC WEAPONS

Potential antipersonnel biological agents are made up of living microorganisms such as fungi, bacteria, rickettsias, and viruses. These biological agents affect the body much like diseases such as typhoid or influenza. But, effects may vary from minor incapacitation (common cold) to prolonged illness that results in death (plague). Biological agents can cover an area larger than all other weapons. Large quantities of food, equipment, and supplies can be contaminated by a single biological attack.



THREAT BIOLOGICAL OPERATIONS

There are no verified instances of the use of biological agents in modern warfare. However, biological agents could be produced, stockpiled, and disseminated without being immediately detected. Poor sanitary conditions during wartime compound biological warfare (BW) detection problems.

Threat forces have the technical capability to produce, store, and deliver biological weapons. Threat scientific and technical literature contains many articles that may have originated from either a biological weapons program or a public health project. Threat forces have a vigorous program for investigating BW pathogens and for guarding against them. Such research could quickly lead to the production of BW agents for offensive use. *Threat dissemination of biological agents could be accomplished by aircraft spray, aerosol bombs and generators, missiles, infected animals, vials, capsules, or hand dispensers.* The selection of a biological agent depends on the target, nature of the operation, climate, and weather. Biological agents may be released in theater reserve forces, marshalling areas, supply depots, and deep rear area installations to impede the support of frontline troops.

THREAT FORCES HAVE THE CAPABILITY OF PRODUCING AND DELIVERING BIOLOGICAL AGENTS

THE CHEMICAL ENVIRONMENT

Chemical weapons are designed to kill or incapacitate personnel. Equipment and facilities are usually not damaged by chemical attack. However, contamination from persistent chemicals ultimately reduces the effectiveness of equipment and facilities because operating personnel must wear protective gear.

In a chemical environment, the standard combat uniform is the chemical overgarment with protective gloves, mask, hood, and overboots. Based on the immediate chemical threat, unit commanders determine what level of mission oriented protective posture (MOPP) or what degree of chemical readiness

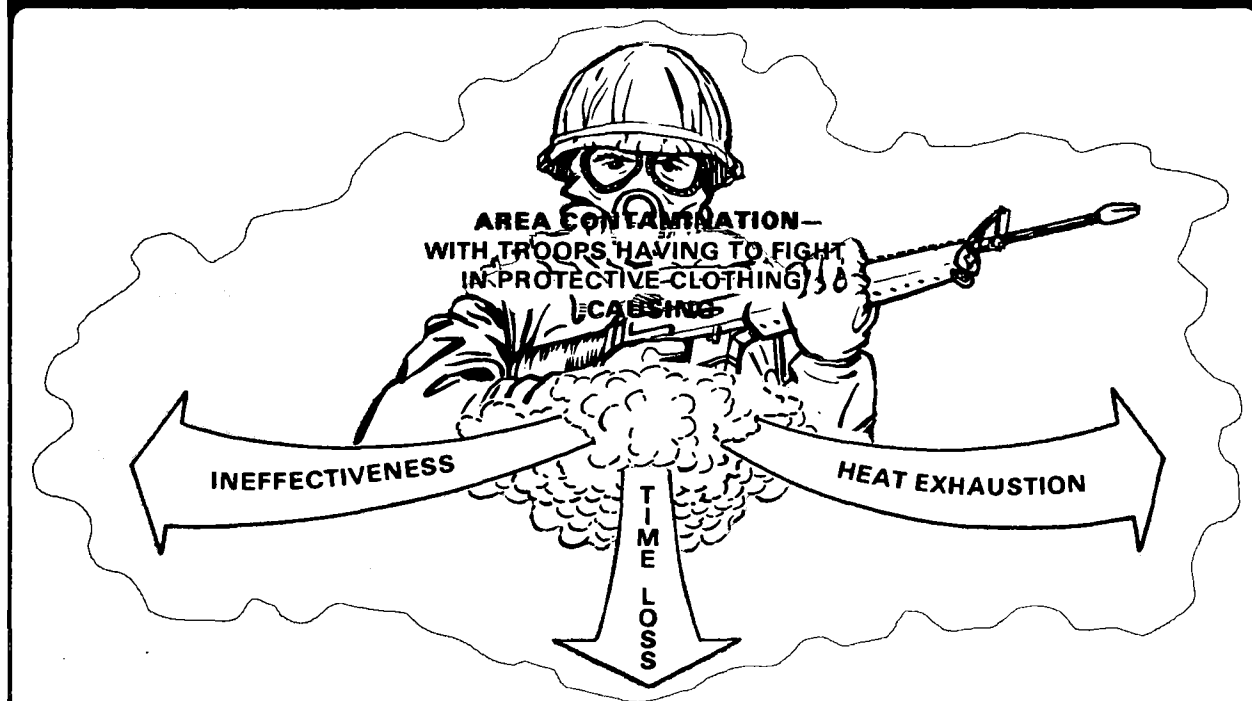
CHEMICAL AGENTS NOT ONLY KILL OR INJURE PERSONNEL BUT ALSO REDUCE THE EFFECTIVENESS OF EQUIPMENT AND FACILITIES

NBC INTELLIGENCE IS NECESSARY IN A CHEMICAL ENVIRONMENT

is to be implemented. Masks must be worn before an attack with nonpersistent agents. But in order for the combined arms team to survive and win the land battle, protective clothing must also be worn before an attack with persistent chemicals. Therefore, *NBC intelligence is a critical factor in preparing to fight in a chemical environment.* Early warning of NBC attacks gives commanders flexibility in determining the MOPP as described in FM 21-40.

Commanders must weigh NBC defensive readiness against their capability to accomplish the mission. Soldiers fighting in protective clothing and masks tire quickly. Heat exhaustion casualties increase. More time is required to get the job done if resources remain constant. But, troops in an area contaminated by persistent chemical strikes can continue to fight because they are protected from the lethal or incapacitating effects of chemical agents. Time consuming decontamination, however, is required before protective measures can be reduced or canceled. Decontamination operations are described in chapter 4.

THE EFFECTS OF THE CHEMICAL ENVIRONMENT



THREAT CHEMICAL OPERATIONS

The decision by Threat force commanders to employ chemical weapons is made at the highest political level. However, after initial employment, chemical weapons may be integrated into fires of the lowest military echelons.

Chemical Munitions

Threat forces produce and stockpile lethal persistent and nonpersistent chemical agents to include nerve, blood, and blister agents. Nerve agents are the most serious threat. However, large amounts of blood and blister agents could also change the course of battle.

Chemical Fire Planning

Chemical weapons are routinely included in Threat fire plans. Chemical-capable weapon systems are assigned chemical targets. These systems include mortars, multiple rocket launchers, field artillery cannons and rockets, and aircraft. Nonpersistent agents are normally used against troop concentrations along avenues of approach and against forces in contact with Threat units. Persistent agents are normally used to seal the exposed flanks of attacking echelons and to disrupt combat support and service support functions in rear areas. Employment priorities for chemical agents in both offense and defense are the same as those for nuclear weapons. However, chemicals play a different role than nuclear weapons in that they do not destroy equipment. Threat chemical weapons are primarily used to—

THREAT FORCES ROUTINELY INCLUDE CHEMICAL WEAPONS IN THEIR FIRE PLANS

- Force the enemy to wear protective gear.
- Restrict the enemy's capability to maneuver and concentrate forces.
- Contaminate the enemy's combat support and combat service support system.

BATTLEFIELD OPERATIONS AND NUCLEAR-CHEMICAL WEAPONS

Units must be prepared to fight in an environment filled with chemical and radiological hazards. Naturally, these hazards complicate operations far beyond problems posed by the primary effects of chemical or nuclear weapons. Therefore, it is necessary to defend against both chemical and nuclear attacks. It is also necessary to use NBC defense personnel and equipment to reduce both chemical and radiological hazards.

The size of the battlefield will strain the resources of every unit to conduct NBC reconnaissance and decontamination. The battlefield will be characterized by areas of both very low and very high troop densities. Over a period of time, numerous areas could be contaminated with NBC agents. *Continuous NBC reconnaissance and extensive reporting and recording of contamination will be necessary.*

NBC RECONNAISSANCE AND DECONTAMINATION GIVE COMMANDERS A CHOICE TO AVOID OR FIGHT THROUGH CONTAMINATION

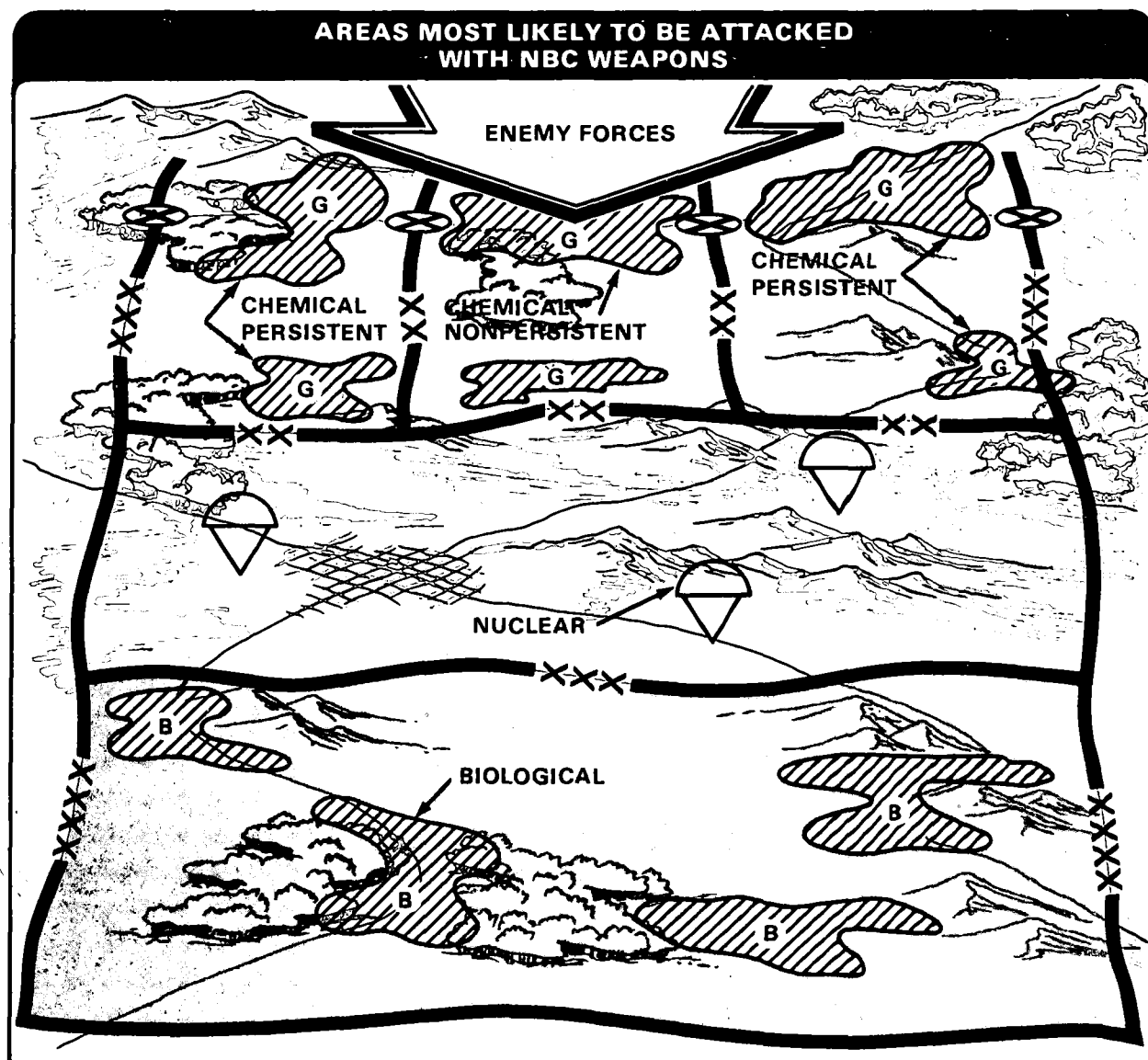
NBC reconnaissance gives commanders a choice. They can avoid contamination or fight through it. Partial equipment decontamination gives commanders the option of limiting the spread of contamination and of making future decontamination easier. In any event, *NBC reconnaissance and decontamination units must remain sufficiently concentrated to get the job done, while at the same time support the entire force.*

NBC defense plans are based on the type, location, and number of NBC weapons used on the battlefield. But, the use of persistent nerve agents will be the most immediate concern and will strain reconnaissance and decontamination units the most. If a variety of NBC weapons are employed, forces engaged on the battlefield may become more concerned with survival rather than with the battle.

The initial use of NBC weapons places excessive demands on the supply system for decontaminants, protective clothing, protective mask filters, and other NBC protective equipment. Some items are not demand-supported because of environmental

peacetime usage constraints and limited training consumption factors. Therefore, contingency stocks are maintained by supply elements to accommodate to the demands of an NBC environment. Time may not allow for complete decontamination operations. Therefore, equipment may have to be repaired while still contaminated. Contaminated ammunition and supplies

may have to be moved to support the immediate battle. To further complicate things, time may not permit the complete decontamination of casualties before they can and must receive medical attention. The combat service support system may be strained. *Individual and unit endurance will no doubt be key to completing the mission successfully.*





CHAPTER 2
**Organization of Nuclear, Biological, and
Chemical (NBC) Units for Combat**

INTRODUCTION

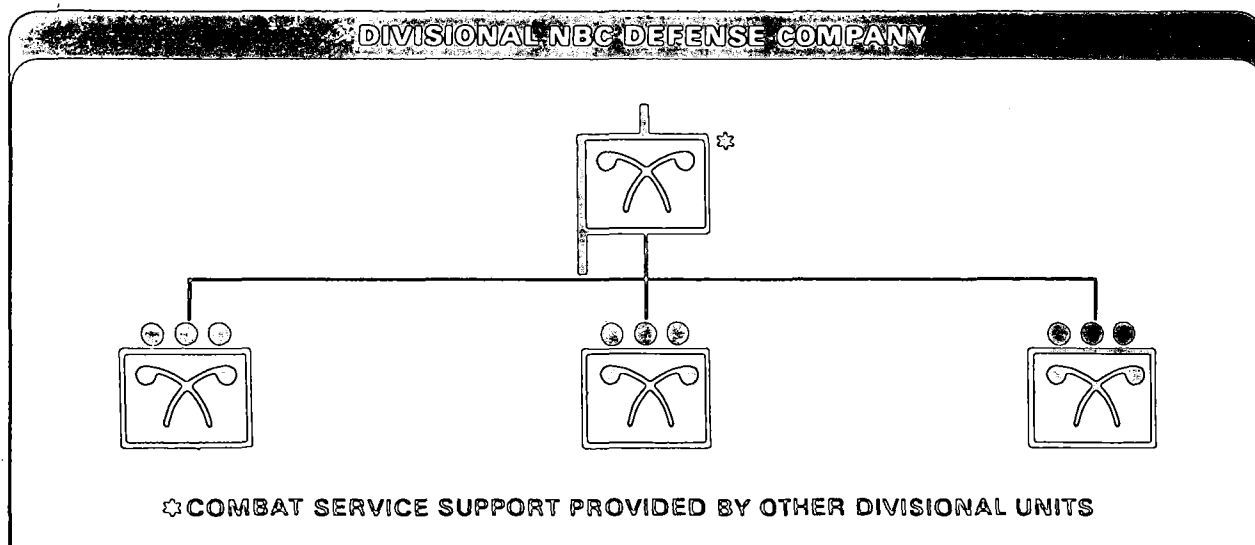
As previously discussed, NBC units must be organized to insure that enough soldiers and equipment are available to accomplish the mission and still support the entire force. To complete strenuous NBC reconnaissance and decontamination operations, special units are assigned to each division, corps support command, separate brigade, and armored cavalry regiment. These units are part of the base structure and are normally attached to other units for administrative and logistical support. To assist the commander in organizing for combat, the senior chemical staff officer determines how NBC units can best be employed to support the overall battle plan. Centralized control and decentralized operations are normally the rule.

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**DIVISIONAL NBC DEFENSE
COMPANY**

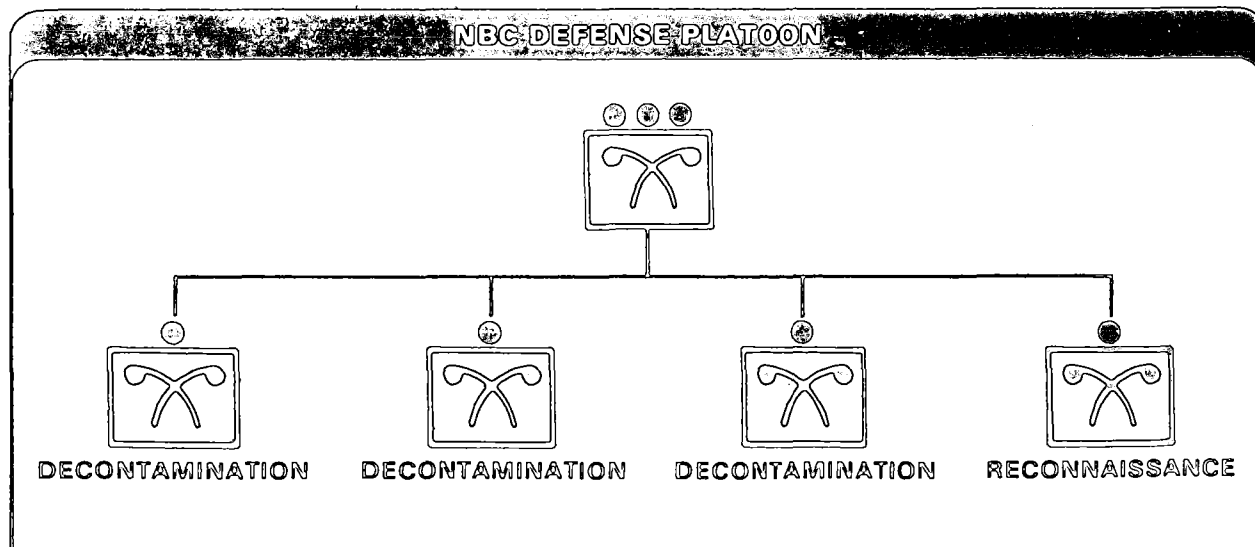
The NBC defense company is the US Army's primary means of defending against NBC contamination in the division. *The company's mission is to locate contaminated areas quickly and to conduct decontamination operations as far forward in the combat zone as possible.*



Organization

An NBC defense company is found in each US Army division. It consists of a company headquarters and three NBC defense platoons. The company headquarters provides command and control, and limited combat service support. The company does

not have enough soldiers and equipment to fully provide for its combat service support requirements. Therefore, combat service support must be provided by other divisional units as explained in chapter 5.



Each *NBC defense platoon* can provide NBC reconnaissance and decontamination support to a maneuver brigade or a similar size force. It consists of three decon-

tamination squads and a reconnaissance squad. The platoon may be attached or placed in direct support of a force requiring its assistance.

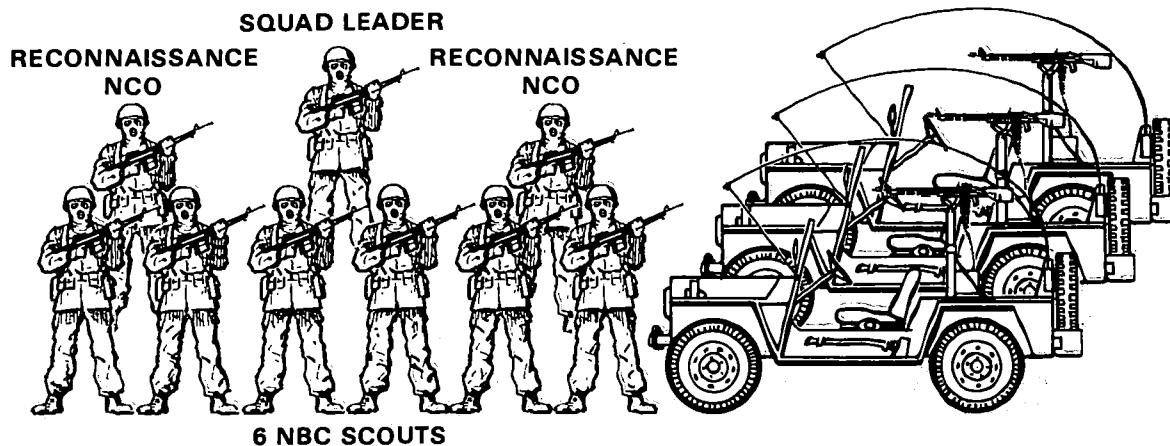
DECONTAMINATION SQUAD



Each *decontamination squad* consists of a squad leader, a decontamination NCO, and six decontamination specialists. It is equipped with a decontamination truck and other necessary decontamination equipment. The decontamination squad conducts decontamination operations as described in

chapter 4. In a non-NBC environment, the squad conducts limited firefighting operations as described in TM 5-315, TM 9-1300-206, and TB 385-2. The squad also conducts clothing exchange and bath operations as described in appendix E.

RECONNAISSANCE SQUAD



The *reconnaissance squad* consists of an NBC reconnaissance sergeant, two reconnaissance NCOs, and six NBC scouts. The squad has three 1/4-ton trucks, each with a pedestal-mounted M-60 machinegun. It is

also equipped with necessary NBC alarms and detection kits. The squad is normally divided into three teams; each is organized with two NBC scouts and led by a noncommissioned officer.

**PRIORITIES FOR THE NBC
DEFENSE COMPANY ARE BASED
ON THE RECONNAISSANCE AND
DECONTAMINATION NEEDS OF
THE OPERATIONS AREA**

Operations

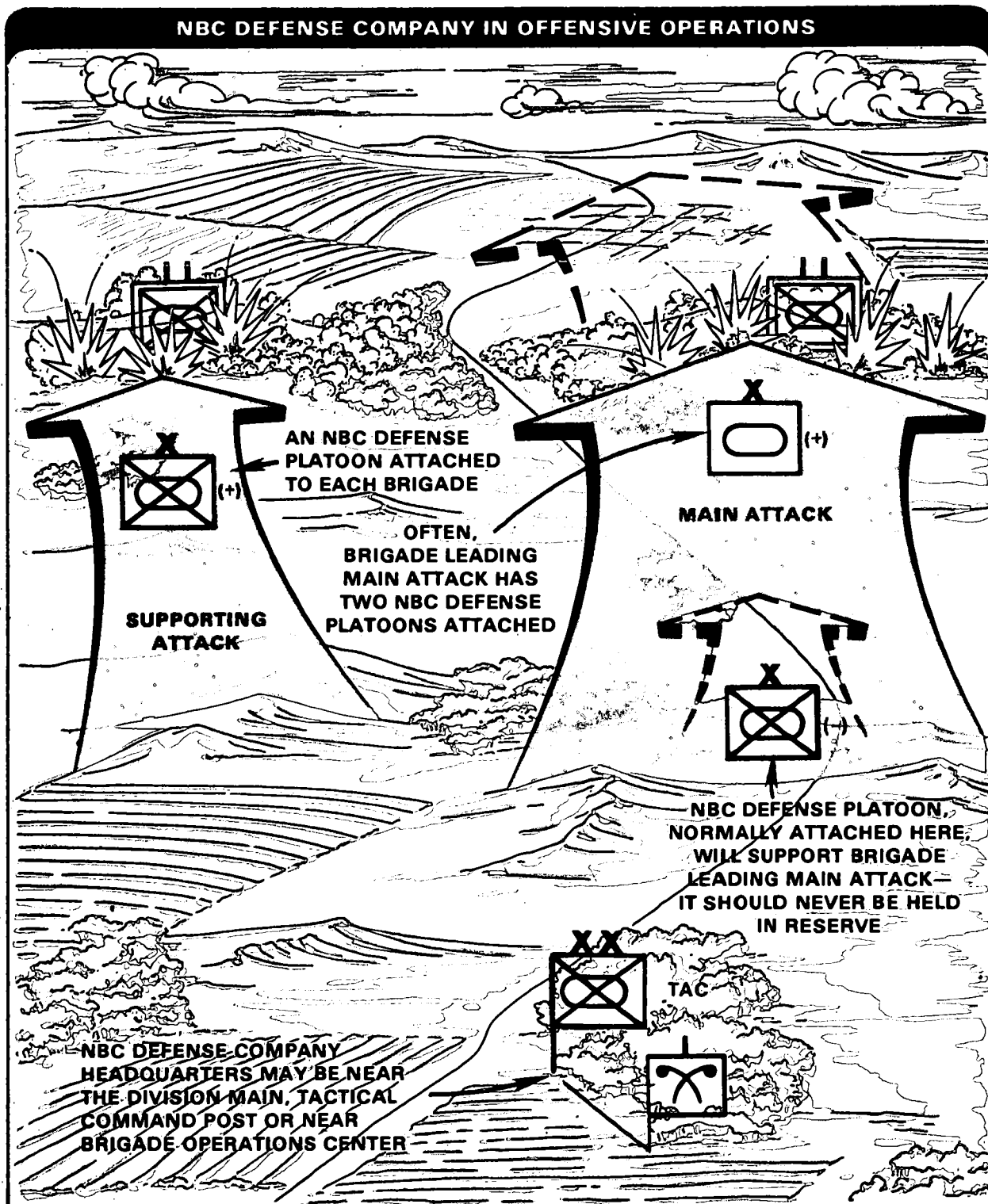
The NBC defense company has a limited capability to perform decontamination and reconnaissance operations. So, it is necessary for the division commander to set priorities for NBC defense company support. Most often, *support is provided first to maneuver battalions, then to field artillery units.* Other combat support and combat service support units operating in forward areas are supported next, followed by those units operating in rear areas. Priorities are changed as necessary. For example, if the enemy concentrates a chemical attack against combat service support units, they would receive priority support.

During *offensive operations*, an NBC defense platoon is generally attached to each brigade, although it may be placed in direct support of a brigade. Sometimes, more than one platoon is found in support of a brigade, particularly when the brigade is making a main attack. NBC defense platoons should never be held in reserve.

The company headquarters operates where it can best command and control the platoons. This location may be near the division main or tactical command post. It may also be near a brigade operations center if more than one platoon is supporting a brigade. In any event, the company headquarters must move when its platoons move in order to maintain contact with the platoons.

One decontamination squad usually operates in support of each maneuver battalion, while the reconnaissance squad operates under the direction of the brigade commander. The platoon headquarters operates near the brigade operations center. When contact is expected, the reconnaissance squad normally moves with the leading battalion task force along a route where the threat of contamination is most dangerous. Since the reconnaissance squad is not equipped to fight to accomplish its mission, it should move with task force scouts to provide for its protection. When this is the case, the reconnaissance squad should operate with the same number of teams as the battalion task force scout platoon.

NBC DEFENSE COMPANY IN OFFENSIVE OPERATIONS



During *defensive operations*, decontamination operations are most often confined to support of contaminated units that may become ineffective unless decontaminated.

The defensive battlefield is usually organized into a covering force area (CFA), a main battle area (MBA), and a rear area. *Forces operating in the CFA fight to determine where the enemy is making his main effort and in what strength.* They also try to deceive the enemy as to where the rest of the defending forces are located, so the enemy deploys prematurely. Forces in the main battle area are organized to defeat those enemy forces not destroyed by the covering force. MBA units are reinforced when the covering force enters the main battle area. Combat service support and some combat support forces are found in rear areas.

**IN THE DEFENSE, NBC
DEFENSE PLATOONS USUALLY
OPERATE IN THE COVERING
FORCE AREA**

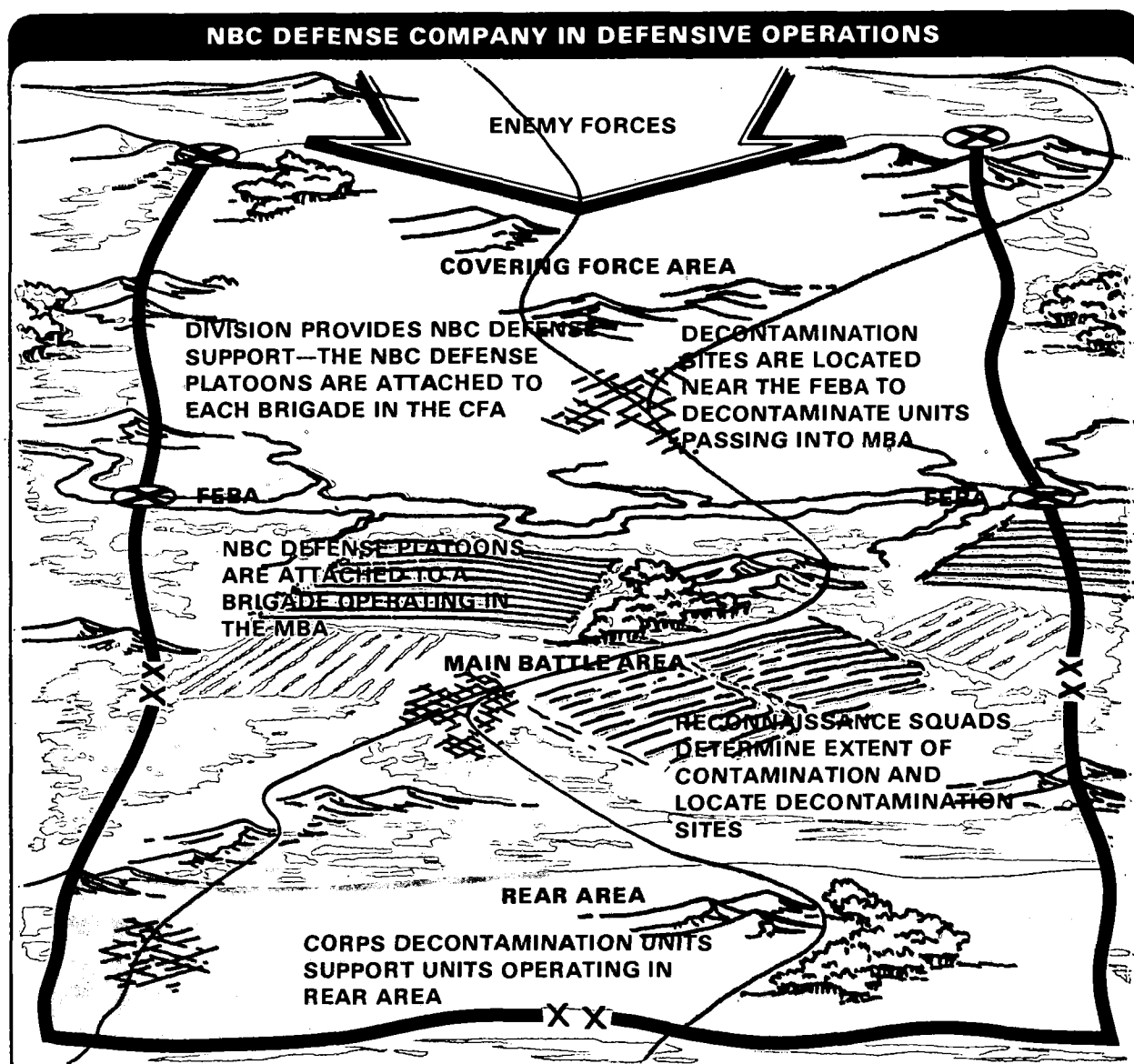
A covering force may be controlled by the corps commander, division commander, or brigade commander. In any event, it is normal to find some or all of the NBC defense platoons operating in the CFA. Even when the corps is controlling covering force operations, the division still provides NBC defense support to the covering force. When brigades are controlling covering force operations, NBC defense platoons are generally attached to each brigade or placed in direct support.

The reconnaissance squad, operating in the CFA, is used to locate suitable sites for partial decontamination operations. These sites are most often located near the forward edge of the battle area (FEBA) to decontaminate units passing into the MBA. Partial decontamination operations are limited to a quick wash which removes gross contaminants and limits spread of contamination. It also makes complete decontamination operations easier at a later time.

Upon completion of a covering force operation, NBC defense platoons are attached to or placed in direct support of a brigade operating in the MBA. In the MBA, decontamination squads continue to provide for decontamination as necessary. Here also, such operations are most often partial until there is time for complete decontamination.

Reconnaissance squads operating in the MBA are used to determine the extent of contamination and to locate decontamination sites. It is common for one, or perhaps two, three-man reconnaissance teams to be kept under division control to determine nature and extent of contamination in areas behind forward brigades. The division usually relies on corps decontamination units to support units operating in division rear areas.

During withdrawal operations, NBC defense platoons normally operate under division control. Decontamination squads are used in an area support role. They operate in an assigned sector and support all units in that sector. As necessary, decontamination squads move to alternate sites with the withdrawing force. They locate potential decontamination sites and direct contaminated units to these sites. They also locate, mark, and determine the nature and type of contaminants found along the route of the withdrawing force.



CORPS SUPPORT COMMAND NBC DEFENSE COMPANY

An NBC defense company, organized in the same way as the divisional NBC defense company, operates with the corps support command (COSCOM). As in the case of the division, it is necessary to set up priorities for the NBC defense company in the COSCOM. Most often, priority is given to corps combat support and service support units operating in forward areas. Next, priority is given to committed divisions and then to forces operating in the corps rear area. It is normal to attach one or more platoons to support groups during both offensive and defensive operations. The COSCOM may retain one platoon under its control for additional support to divisions.

COSCOM NBC defense company reconnaissance squads operate in the same way as divisional reconnaissance squads. They look for decontamination sites, find contaminated areas, and direct units to decontamination sites. During withdrawal operations, platoons provide area support as do divisional companies. When it is necessary to decontaminate terrain along a route of withdrawal, corps decontamination units are concentrated to accomplish the mission.

SEPARATE RECONNAISSANCE AND DECONTAMINATION DETACHMENTS

**RECONNAISSANCE AND
DECONTAMINATION
DETACHMENTS MAY ALSO
REINFORCE DIVISIONAL AND
CORPS NBC DEFENSE COMPANIES**

One reconnaissance detachment and one decontamination detachment is found in each armored cavalry regiment and separate brigade. These detachments may also reinforce divisional and corps NBC defense companies.

Reconnaissance detachments are organized with a headquarters and three teams, similar to reconnaissance squads found in NBC defense companies. Armored cavalry regimental or separate brigade reconnaissance detachments are normally controlled by the regimental or brigade

headquarters. However, one or perhaps two teams may operate with a squadron or battalion task force if the route of advance is subject to NBC contamination. Reconnaissance detachment teams generally operate in the same way as NBC defense platoon reconnaissance squads.

Decontamination detachments are organized with three or more teams. The teams are similar to decontamination squads found in NBC defense companies. One, or sometimes more than one team, is placed in direct support of a squadron or battalion task force. Decontamination detachment teams operate in the same way as NBC defense platoon decontamination squads.

NBC ELEMENTS (NBCE) AND NBC ELEMENT DETACHMENTS

NBC elements are found in armored cavalry regiments, separate brigades, divisions, and corps. They may be augmented by NBCE detachments to achieve continuous operations. In the case of divisions and corps, the NBCE is found in the chemical section of the headquarters and headquarters company. If a unit does not have an organic NBCE, an NBCE detachment (JB) may be provided for continuous operations. The NBCE should operate with the unit's fire support element (FSE). NBCE personnel work with the unit's fire support officer, operations officer (S3 or G3), and intelligence officer (S2 or G2). The NBCE is used to—

The NBCE is used to—

- Perform chemical and nuclear target analysis.
- Prepare friendly nuclear and chemical strike warnings (STRIKWARN).
- Determine the radiation service category for division and corps units.
- Receive and analyze NBC reports.
- Perform NBC attack vulnerability analysis.
- Disseminate NBC contamination warnings.

These functions are described in FM 3-12, FM 21-40, and FM 3-10. They are also covered in 101-31 series field manuals.

During offensive operations, the NBCE determines how vulnerable attacking units are to enemy NBC weapons. If necessary, *NBCE personnel can suggest a change to the concept of operation should it appear that the concept involves unacceptable risks from enemy weapons.* The NBCE, division, and corps chemical officers work with the G2 element to—

- Develop an intelligence gathering plan for NBC operations.
- Analyze enemy NBC capabilities.
- Determine enemy intentions for using NBC weapons.
- Prepare the battlefield for nuclear-chemical operations.

The NBCE also works with the G3 to identify friendly units best suited for specific missions because of previous radiation exposure. *Units that border between combat effective and combat ineffective are identified; risks of committing them are assessed; and employment limitations, if any, are recommended.* Contaminated areas, identified by NBC reconnaissance units, are assessed to—

- Determine their effect on current and future operations.
- Decide whether to cross or bypass the area.
- Provide mission oriented protective posture (MOPP) guidance to subordinate units.

During defensive operations, the NBCE works with the FSE, G2, and G3 to refine nuclear and chemical fire plans. As in offensive operations, the NBCE evaluates any NBC information that is necessary for the conduct of combat operations. This is done by using the standardized NBC reporting system described in FM 21-40. The NBCE prepares and sends NBC-3 reports to alert units to possible residual hazards from NBC strikes. These reports are based on data

received from incoming NBC-1 and NBC-2 reports. Battalion and brigade commanders use the NBC-3 report to—

- Analyze the potential effect of NBC attacks on current and future operations.
- Plan defensive measures.
- Alter plans and orders as necessary.

NBC-4 (nuclear) reports are received from NBC reconnaissance units, brigades, and separate units to—

- Identify the actual location of radiological hazards.
- Determine the intensity of radiological hazards.

The NBCE then prepares and sends NBC-5 reports (developed from NBC-1 and NBC-4 reports) to identify actual NBC hazards. Battalion and brigade commanders use the NBC-5 report to—

- Update the effect of NBC attacks on current and future operations.
- Modify defensive actions taken to reduce NBC hazards.
- Change plans and orders as necessary.

When the decision to employ nuclear-chemical weapons is made, the NBCE sends STRIKWARN messages. Only those units subject to the initial or residual effects of nuclear and chemical strikes are warned so they can take protective measures. All other units continue their mission. When the NBC reporting system fails to provide necessary information, the NBCE plans aerial and ground radiological surveys. *Such surveys are performed by NBC reconnaissance units or sometimes by NBC defense teams from combat, combat support, or combat service*

support units. These teams consist of soldiers trained in radiological survey. The teams use unit equipment. Whatever method is used to

gather information, the NBCE uses the information to determine if decontamination is required.

WHEN THE NBC REPORTING SYSTEM FAILS



TROOP LEADING PROCEDURES

In order to operate in combat, it is necessary to prepare for combat operations. Regardless of the type of NBC unit, each prepares for combat in essentially the same way. NBC unit leaders follow a prescribed process in preparing their units for combat operations. This process is called *troop leading procedures*.

Using troop leading procedures, the leader issues instructions to his subordinates. The lower the echelon, the more simple, direct, and rapid is this process. Nevertheless, all the steps should be taken even if they involve only a few seconds. Once operations start, subsequent orders and responses must be fast, effective, and simple.

The eight steps to troop leading are as follows:

- Step 1. Receive the mission.
- Step 2. Issue a warning order.
- Step 3. Make a tentative plan.
- Step 4. Start troop leading and movement.
- Step 5. Reconnoiter.
- Step 6. Complete the plan.
- Step 7. Issue orders.
- Step 8. Supervise and refine.

These steps are not rigid. They can be modified to fit the mission and situation. Some steps are often taken at the same time. Others are considered throughout the operation when there is sufficient time.

Step 1. Receive the mission.

Commanders may receive a mission in either an oral or written operation order (OPORD) or fragmentary order (FRAGO). Upon receiving the order, the leader analyzes his mission and plans the use of his time.

Step 2. Issue a warning order.

A commander issues a warning order by telling his subordinates about the mission. He also tells them when it will start and where the complete order will be issued. This allows his subordinates to plan their time efficiently. A warning order is usually issued orally through the chain of command. All personnel must be kept informed of *what* they are to do and *why* they are to do it.

Step 3. Make a tentative plan.

The commander should make a tentative plan of how he intends to accomplish his mission. Company commanders normally have uncomplicated missions, and because their time is usually limited, they quickly produce tentative plans. Each commander knows his own unit situation and as much about the enemy as circumstances allow. He also knows the mission and what it requires. The tentative plan he develops is the basis for coordination, movement, reorganization, and reconnaissance.

Step 4. Start troop leading and movement.

The commander has many important matters on his mind at this point. Often, the driving consideration is the absolute necessity of properly using available time. He must be ever mindful that his subordinate leaders also need time. The commander must reconnoiter to verify or modify his tentative plan. The unit may be required to move, and it may need reorganization for the tasks at hand. Subordinate leaders must also reconnoiter and plan. In addition, crews and squads must ready their vehicles. All these things must be done almost at the same time or at least with minimum loss of time. The commander must have a standing operating procedure. His unit must practice until the procedure can be done smoothly, even when fragmentary orders require sudden mission changes or when orders are received while moving.

When the commander is called to receive an order, he should take along some other soldier in authority (often the first sergeant) who can return to the unit to issue a warning order and move the unit if necessary. The commander must decide instantly when and where he will issue the final order and then convey this information to his subordinates. Whatever the system, it must work effectively because mission accomplishment often depends upon it.

Step 5. Reconnoiter.

To move, the commander must use terrain, thus reducing his vulnerabilities. Personal reconnaissance lets the commander verify his tentative plan. This verification may lead to minor modifications. If the area cannot be completely reconnoitered due to distance or enemy presence, the commander can only make detailed plans of the part that he has seen. Other instructions must be given in general terms and confirmed or changed as the terrain is revealed during movement.

Step 6. Complete the plan.

As a result of reconnaissance, the commander adds detail to his tentative plan, and he may even alter it. As the time for issuing the actual order draws near, the commander quickly reviews his concept and

identifies specific tasks for his subordinate units.

Step 7. Issue orders.

Most orders are issued orally. If the commander has conducted a reconnaissance, he usually issues orders from a vantage point in the assigned area. This permits him to point out particular terrain features on the ground as well as on a map. It also eliminates the time which might be wasted in driving back to a command post only to speak to subordinates who would then drive forward to reconnoiter. If the unit is already involved in an operation, orders may not only be issued in person but also by radio or messenger.

Step 8. Supervise and refine.

Commanders must supervise the operation to insure that all necessary preparations are made. This includes coordination, organization, movement, and any other required actions. Supervision of fire support and maintenance is also part of the commander's job. Once the operation is under way, the commander must insure that the plan is followed. He must also issue fragmentary orders to modify or refine the operation as the situation develops. Supervision is a continuous action which is as important as issuing the order.

OPERATIONS SECURITY

Throughout the planning, preparation, execution, termination, and postoperation phases of a mission, every effort must be made to maintain security. Operations

security (OPSEC) is an integral part of unit training and day-to-day operations at all levels of command.

There are four logical steps in the OPSEC planning sequence:

1. Determine enemy capabilities for obtaining information about the operation.
2. Determine what information can compromise the operation if obtained by the enemy and determine when the enemy needs the information in order to react effectively.
3. Determine what actions, taken before an operation, could provide the enemy with the information he needs.
4. Determine what protective measures are necessary and where these measures must be implemented in order to increase operations security.

Some OPSEC measures are given below.

- ***Physical security*** is the use of security forces, barriers, and anti-intrusion devices to deny enemy access to facilities, equipment, material, and personnel.
- ***Signal security*** is the use of communications security techniques (communication codes, secure voice equipment, good radio and telephone procedures) and electronic security techniques (radio silence, proper positioning of radars and antennas) to prevent the disclosure of operational information.
- ***Information control*** is the regulation of written, verbal, and graphic information to prevent the disclosure of operational information.
- ***Countersurveillance*** is the denial of information to the enemy in the visual, infrared radar, and sonic portions of the energy spectrum. It includes the use of camouflage, heat shields, reflectors, noise and light discipline, smoke, and other measures that prevent the enemy from "seeing" friendly activities.

CHAPTER 3

Nuclear, Biological, and Chemical (NBC) Reconnaissance Operations

INTRODUCTION

The purpose of reconnaissance operations is to gather information upon which commanders may form plans, decisions, and orders. Reconnaissance is necessary to reduce the uncertainties of battle, such as finding contaminated terrain before a force blunders through it. As a general rule, NBC reconnaissance squads and detachments give early warning of NBC attacks, locate contaminated areas and decontamination sites, and guide units out of contaminated areas to decontamination sites.

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HOW NBC RECONNAISSANCE TEAMS OPERATE

NBC reconnaissance teams normally operate in one of the following three ways:

- With another reconnaissance unit, a battalion task force, a scout platoon, or a cavalry scout section. When this is the case, NBC reconnaissance teams move as directed by the leader in charge of the operation.
- Independently beyond mutual support of another unit. Here, good use of terrain—taking full advantage of cover, concealment, and stealth—is very important. In some cases, speed is more important.
- With one or two NBC reconnaissance teams.

Even if NBC weapons have not yet been used in combat, NBC reconnaissance units reconnoiter to give the earliest possible warning of an NBC attack. Early warning enables commanders to implement the appropriate mission oriented protective

posture (MOPP) for their troops. *To survive and accomplish their mission, units must*

implement NBC protective measures prior to being attacked.

FUNDAMENTALS OF RECONNAISSANCE

NBC reconnaissance units are not equipped to fight to gain information. So, they must rely on *speed* and *stealth* to accomplish their mission. Four fundamentals generally guide NBC reconnaissance unit leaders.

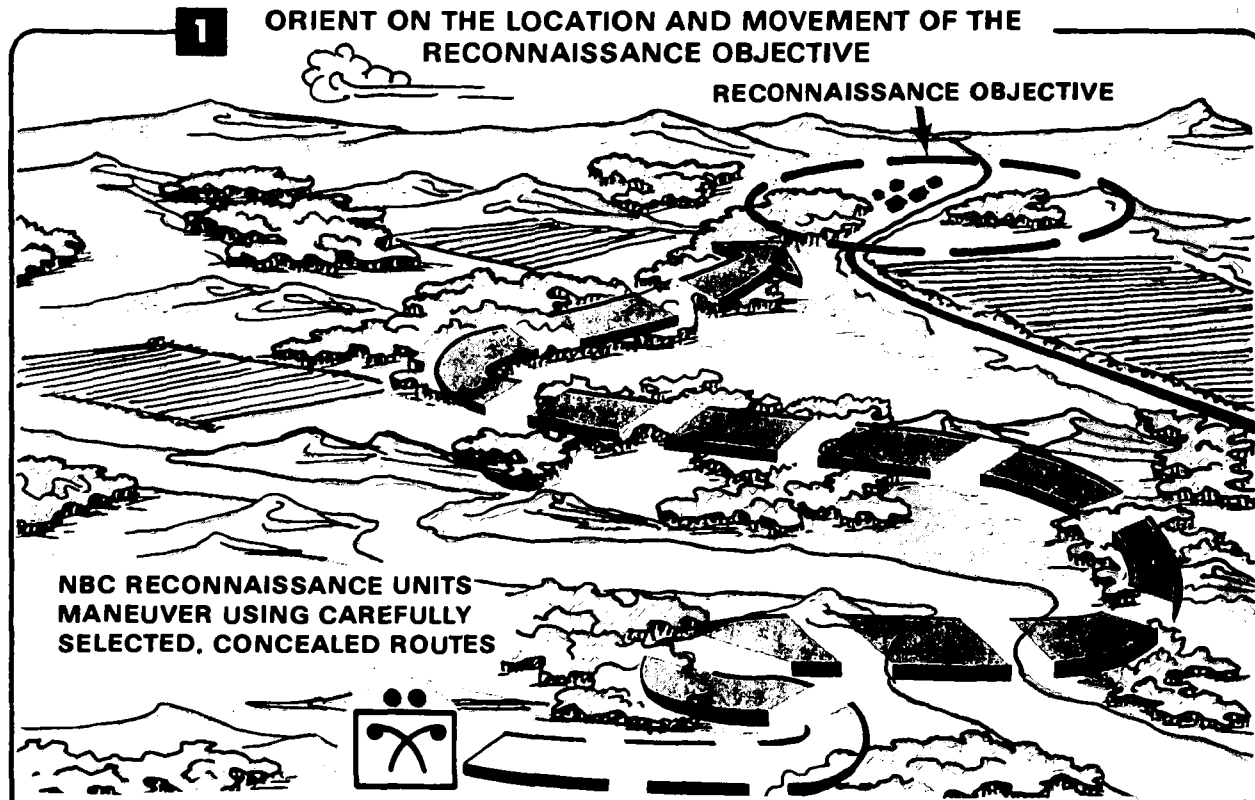
When reconnoitering, these fundamentals are applied by NBC reconnaissance units in much the same way as cavalry units apply similar fundamentals. Because of this, the reader should have a thorough knowledge of the information found in chapter 5, FM 17-95. Each fundamental is discussed separately.

The four reconnaissance fundamentals are:

- 1** Orient on the location and movement of the reconnaissance objective.
- 2** Report all information rapidly and accurately.
- 3** Retain freedom to maneuver.
- 4** Develop the situation rapidly.

1

Orient On the Location and Movement of the Reconnaissance Objective. NBC reconnaissance units maneuver using traveling, traveling overwatch, and bounding overwatch techniques as described later in this chapter. They orient primarily on the reconnaissance objective. *Terrain is carefully selected to provide the best possible cover and concealment without degrading the unit's ability to accomplish its mission.*



2

Report All Information Rapidly and Accurately. All information is reported. Information appearing unimportant may be valuable when used with other information. When NBC weapons are used, *it is just as important to know that certain terrain is not contaminated as it is to know that other terrain is contaminated.* NBC reconnaissance units report information using the NBC reporting system as described in chapter 2 and in FM 21-40.

2**REPORT ALL INFORMATION RAPIDLY AND ACCURATELY**

IMMEDIATE, IMMEDIATE, ECHO FOUR ZULU ZERO THREE, THIS IS QUEBEC SEVEN ROMEO ZERO SIX, NBC NUCLEAR. LINE QUEBEC, BRAVO ROMEO 420531. BREAK ROMEO 50. BREAK SIERRA 131210 ZULU, OVER.

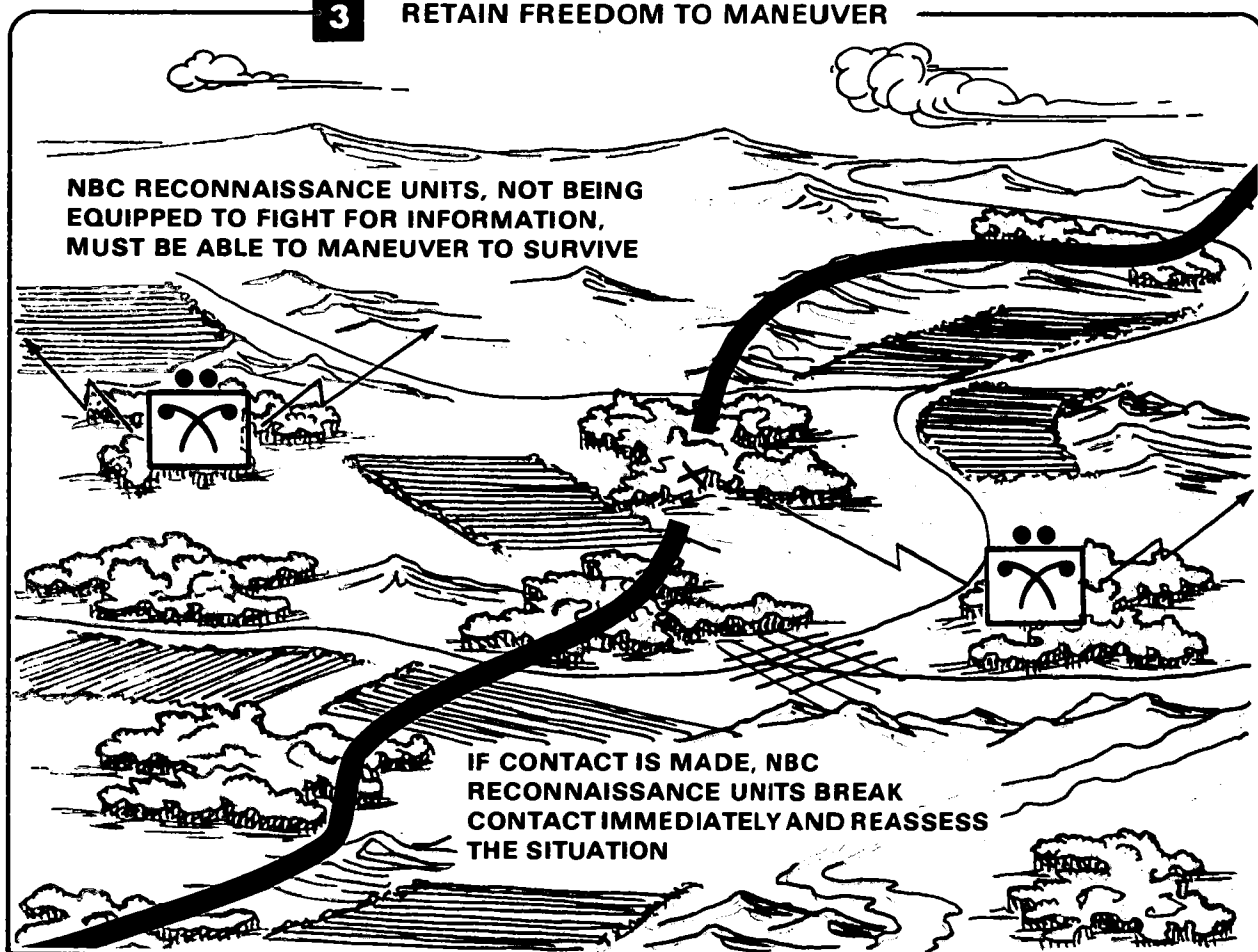


3

Retain Freedom to Maneuver. Just as cavalry must move to live, so must reconnaissance units. NBC reconnaissance units, operating independently, avoid contact with the enemy since they are not equipped to fight for information. When necessary, they obtain information by stealth. They use overwatch, take advantage of terrain, and move on covered and concealed routes. When the ability to maneuver is lost, they operate with other units, such as battalion task force scouts or cavalry units, to enhance mission accomplishment. In any event, *if contact is made when operating independently, NBC reconnaissance units break contact immediately and reassess the situation.*

3

RETAIN FREEDOM TO MANEUVER



4

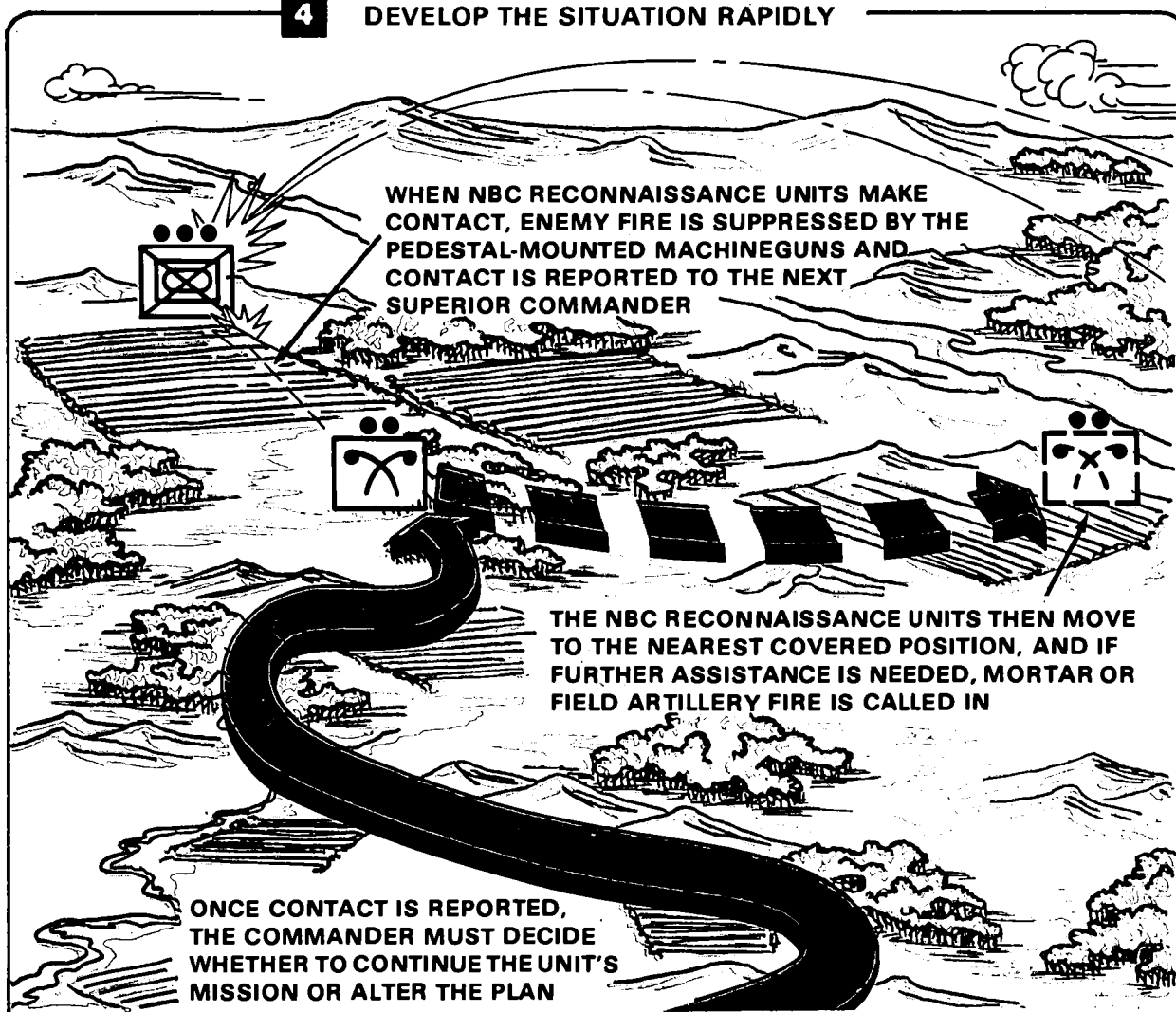
Develop the Situation Rapidly. NBC reconnaissance units, operating independently, do not engage the enemy except in self-defense. If contact is made, enemy fire is immediately suppressed by the pedestal-mounted machinegun. Contact is then reported to the next superior commander, and the reconnaissance team moves to the nearest covered position. If further assistance is needed, mortar or field artillery fire is called in by the team in contact or an overwatching element. Attack helicopters may also be used against enemy

vehicles, particularly hard targets like tanks. Once contact is reported, the commander controlling the operation must decide whether the engaged team should continue the operation or alter its plan. *Orders must flow at once.*

NBC reconnaissance teams, working with a battalion task force or a cavalry unit, operate as directed by the leader of the force conducting the operation. This may often require NBC reconnaissance teams to keep the enemy in view once he is spotted.

4

DEVELOP THE SITUATION RAPIDLY



MOVEMENT TECHNIQUES

Movement techniques provide for maximum feasible speed, good use of terrain, and security of the reconnoitering unit. There

are three basic movement techniques. Their use depends on the likelihood of enemy contact.

THE THREE MOVEMENT TECHNIQUES AND LIKELIHOOD OF CONTACT

TECHNIQUE	CONTACT
① TRAVELING	NOT LIKELY
② TRAVELING OVERWATCH	POSSIBLE
③ BOUNDING OVERWATCH	EXPECTED

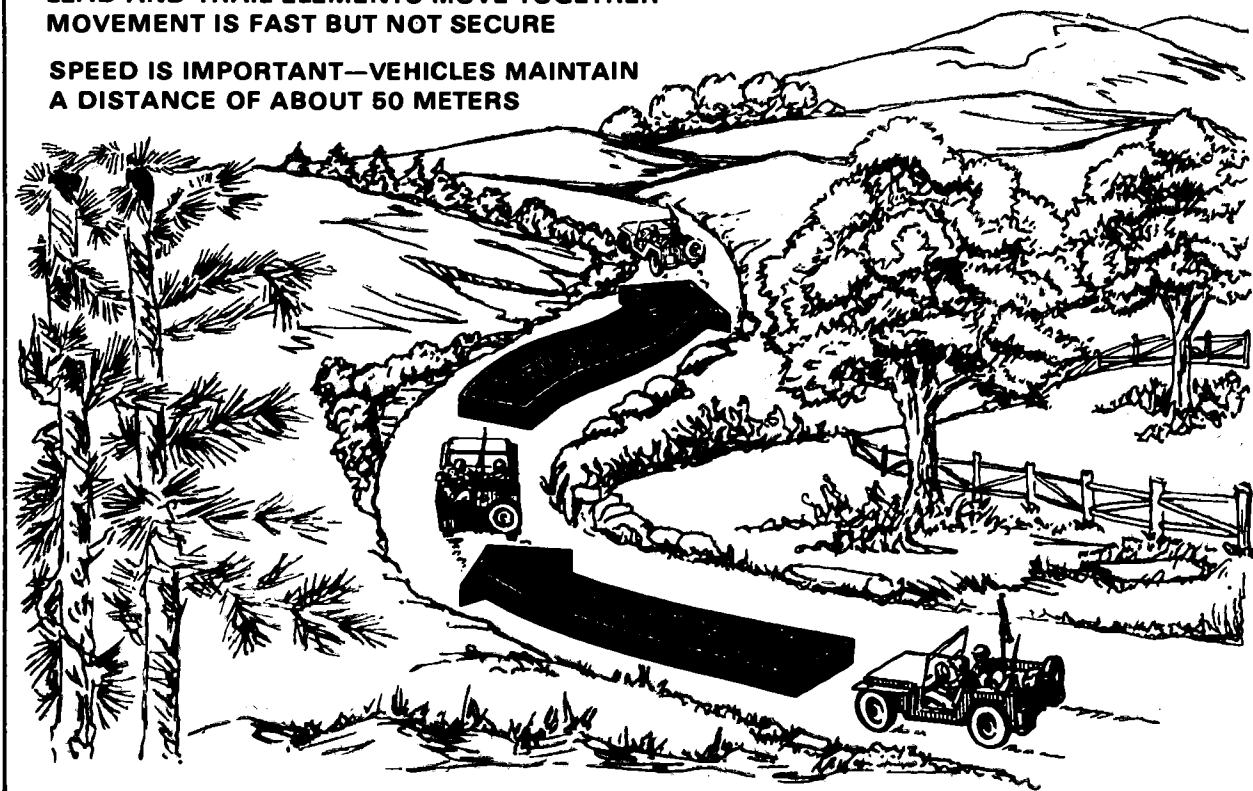
① Traveling. When using this technique, the lead and trail elements move together as a unit. It is the fastest but least secure method, and it is used when speed is important and enemy contact is not likely. Movement is

continuous. The interval between vehicles is maintained as terrain permits. But as a general rule, it is about 50 meters between vehicles.

① TRAVELING TECHNIQUE

LEAD AND TRAIL ELEMENTS MOVE TOGETHER—
MOVEMENT IS FAST BUT NOT SECURE

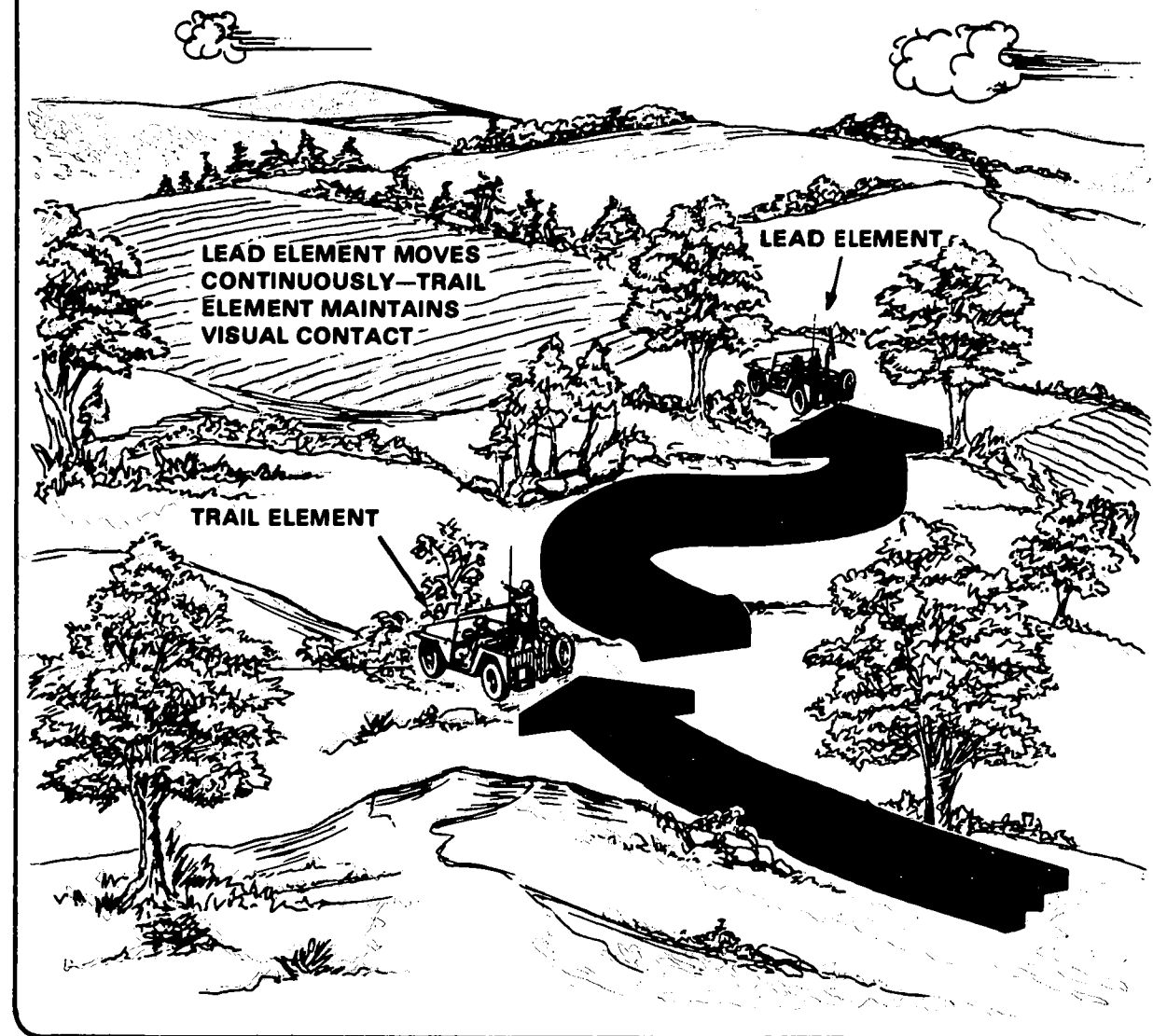
SPEED IS IMPORTANT—VEHICLES MAINTAIN
A DISTANCE OF ABOUT 50 METERS



2 Traveling Overwatch. When using this technique, lead and trail elements also move together, but at a greater distance. The lead element moves continuously on the most covered and concealed route for protection against enemy observation and fire. The trail element moves at various speeds,

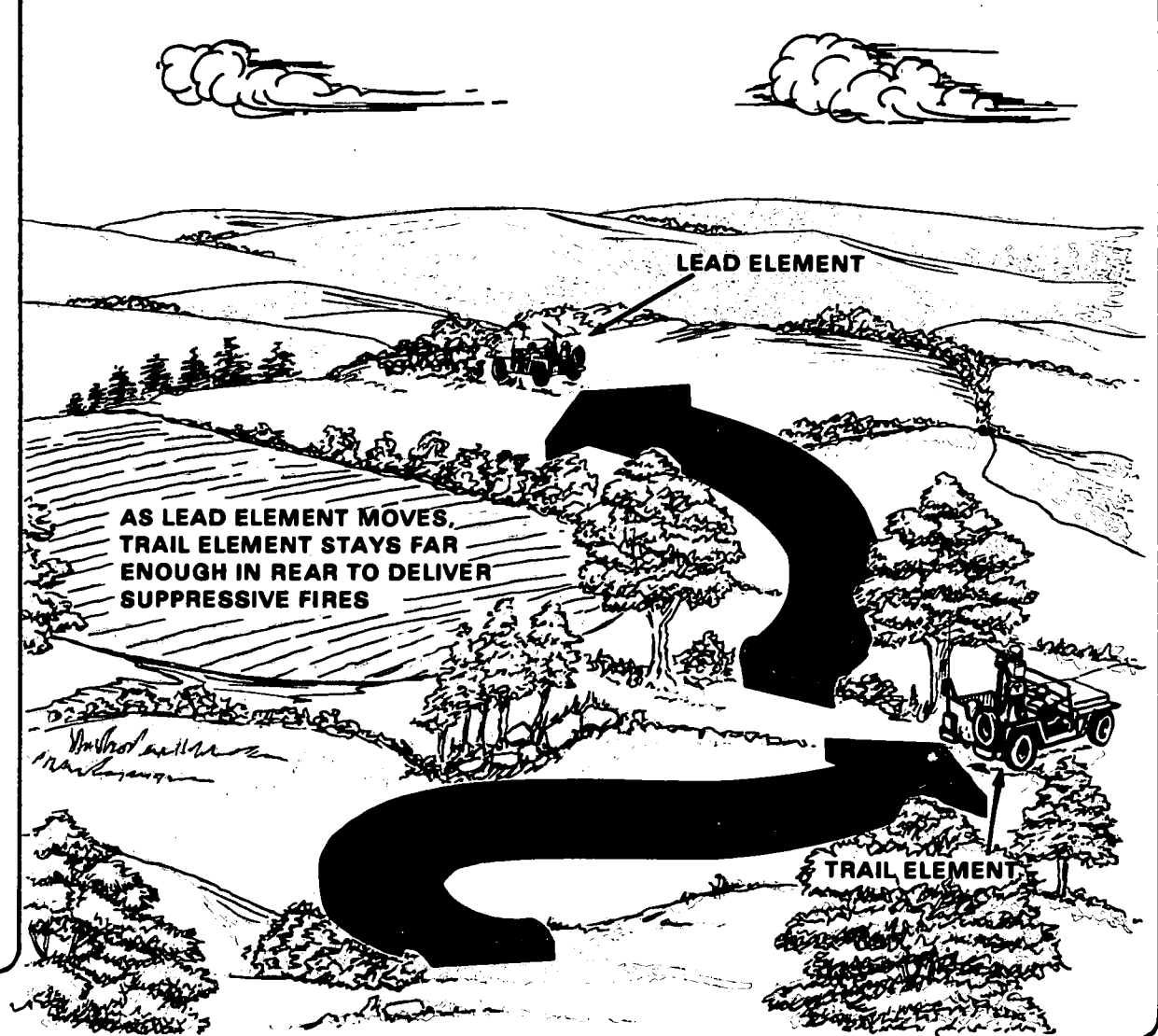
maintaining visual contact with the lead element. The trail element must be far enough in the rear to maneuver or deliver suppressive fires if the lead element receives enemy direct fire. Traveling overwatch is used when speed is important, but enemy contact is possible.

2 TWO-TEAM TRAVELING OVERWATCH TECHNIQUE STEP 1

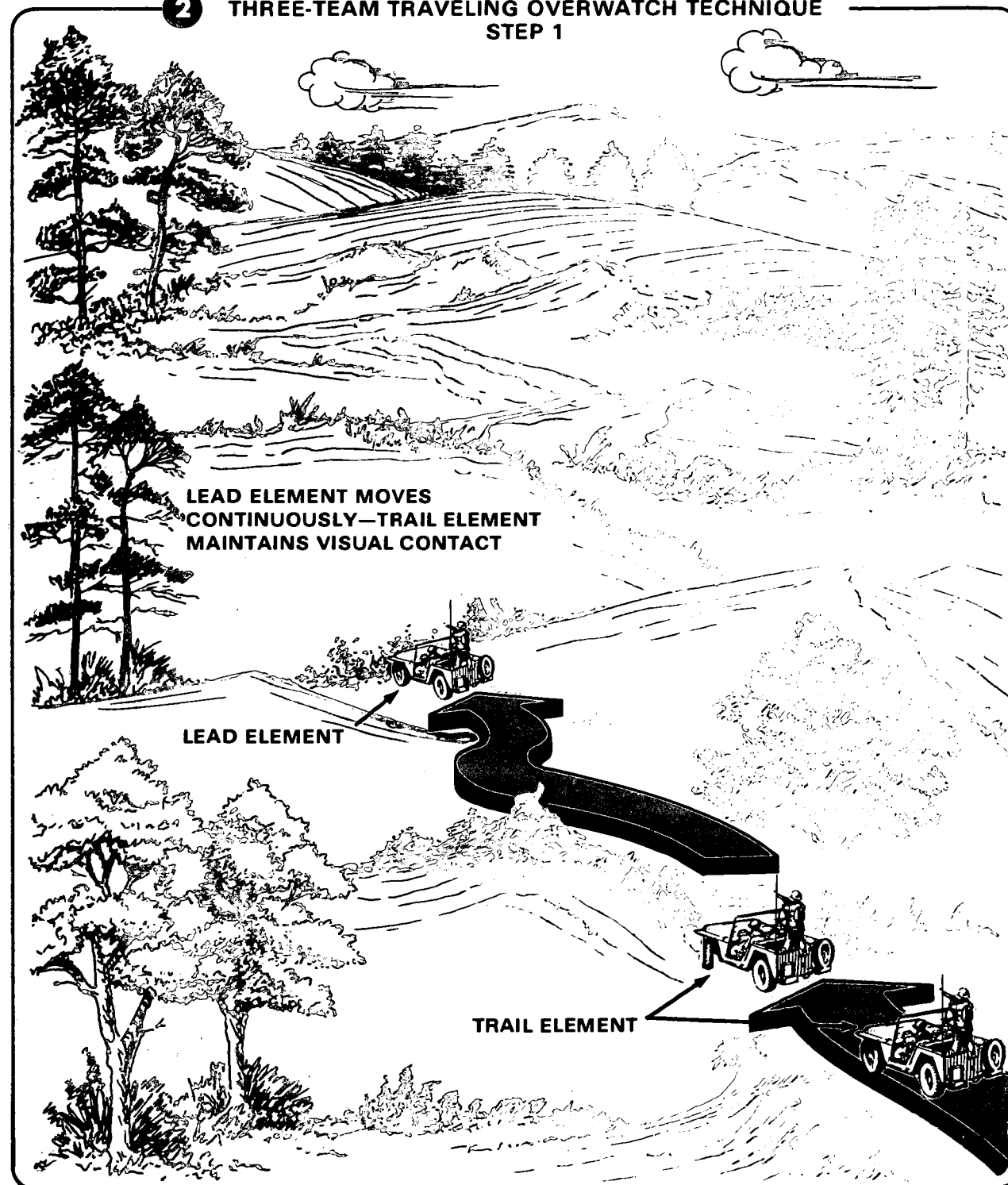


THREE-TEAM TRAVELING OVERWATCH TECHNIQUE NEXT PAGE

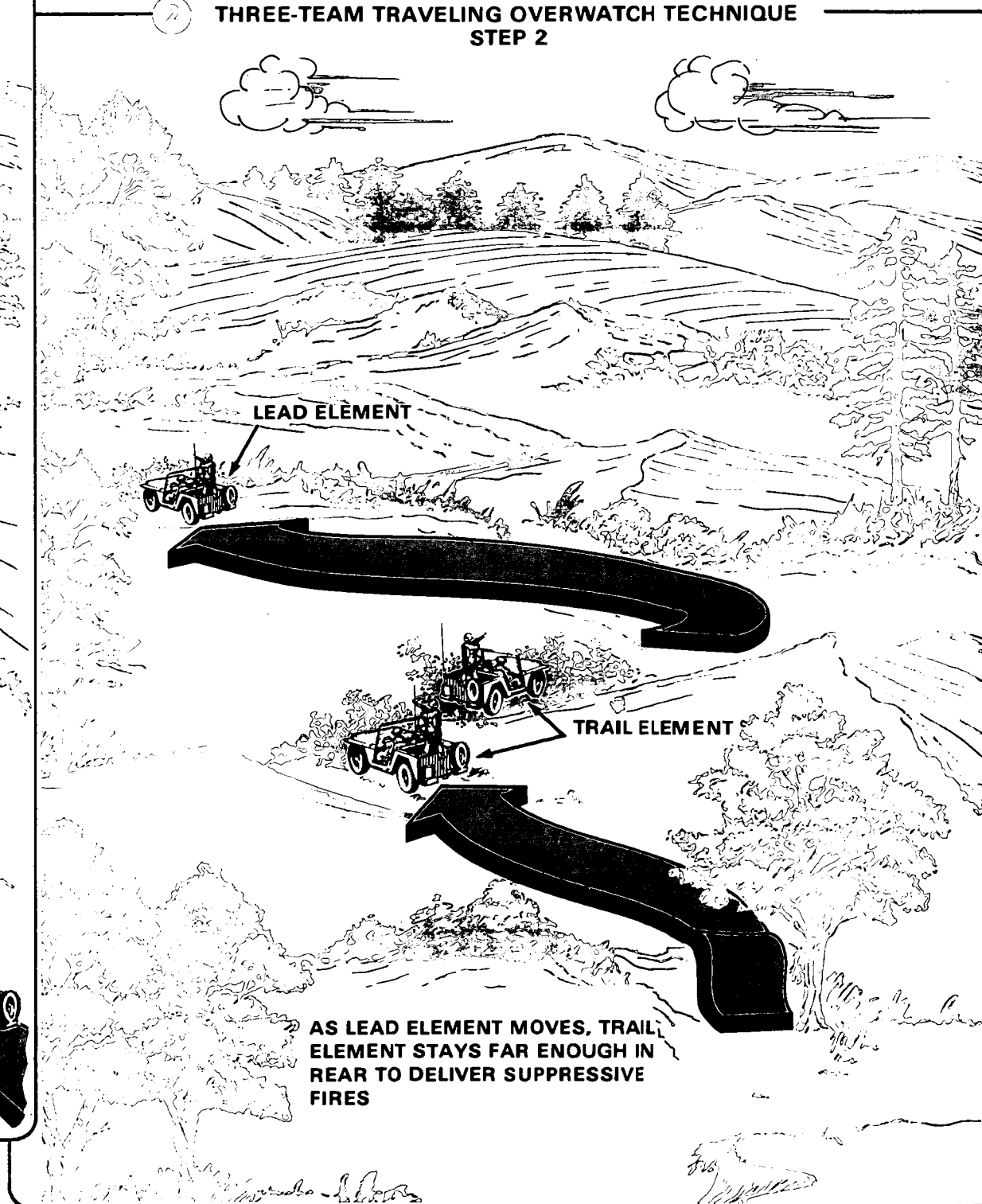
2 TWO-TEAM TRAVELING OVERWATCH TECHNIQUE STEP 2



**2 THREE-TEAM TRAVELING OVERWATCH TECHNIQUE
STEP 1**



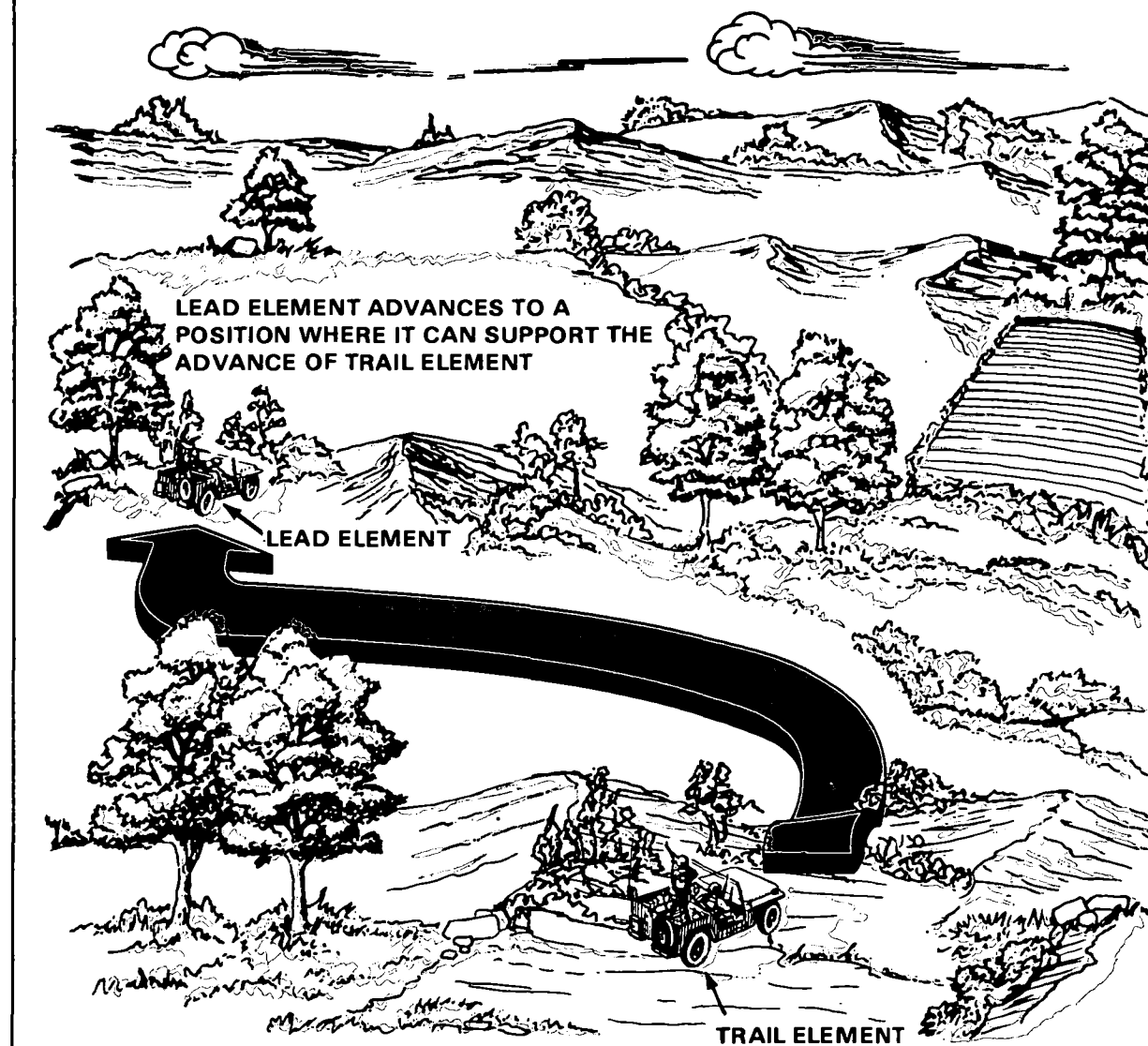
**2 THREE-TEAM TRAVELING OVERWATCH TECHNIQUE
STEP 2**



3 Bounding Overwatch. When using this technique, both teams move by bounds with one element always in position to overwatch another. It is the slowest movement technique and is used when enemy contact is expected. The lead element advances to a position where it can support the advance of

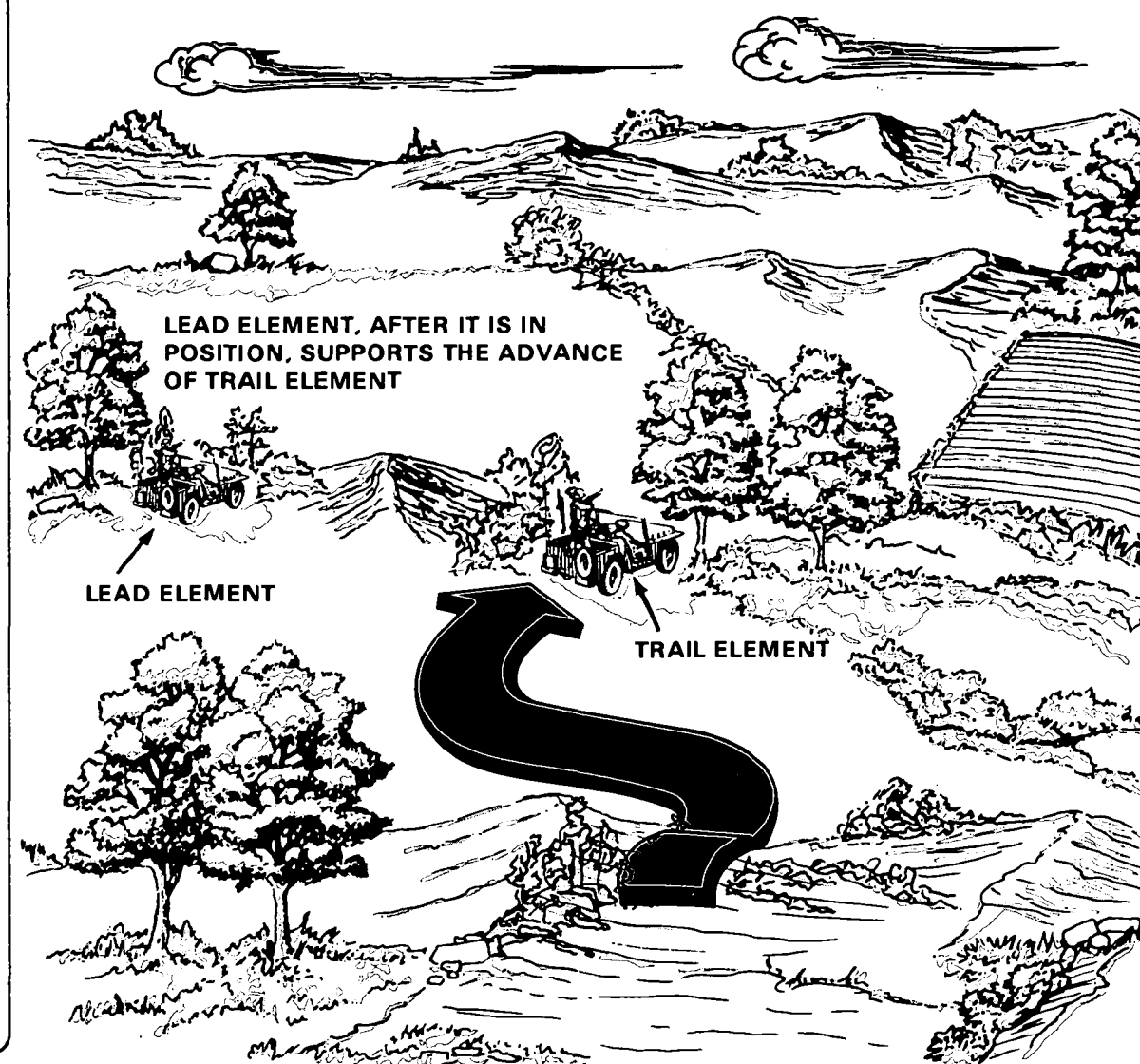
the trail element. There are several ways for the trail element to move. This movement depends on the terrain and organization of the reconnoitering unit. Chapters 4 and 5 of FM 17-95 describe movement techniques in more detail.

3 TWO-TEAM BOUNDING OVERWATCH TECHNIQUE STEP 1



TWO-TEAM BOUNDING OVERWATCH TECHNIQUE
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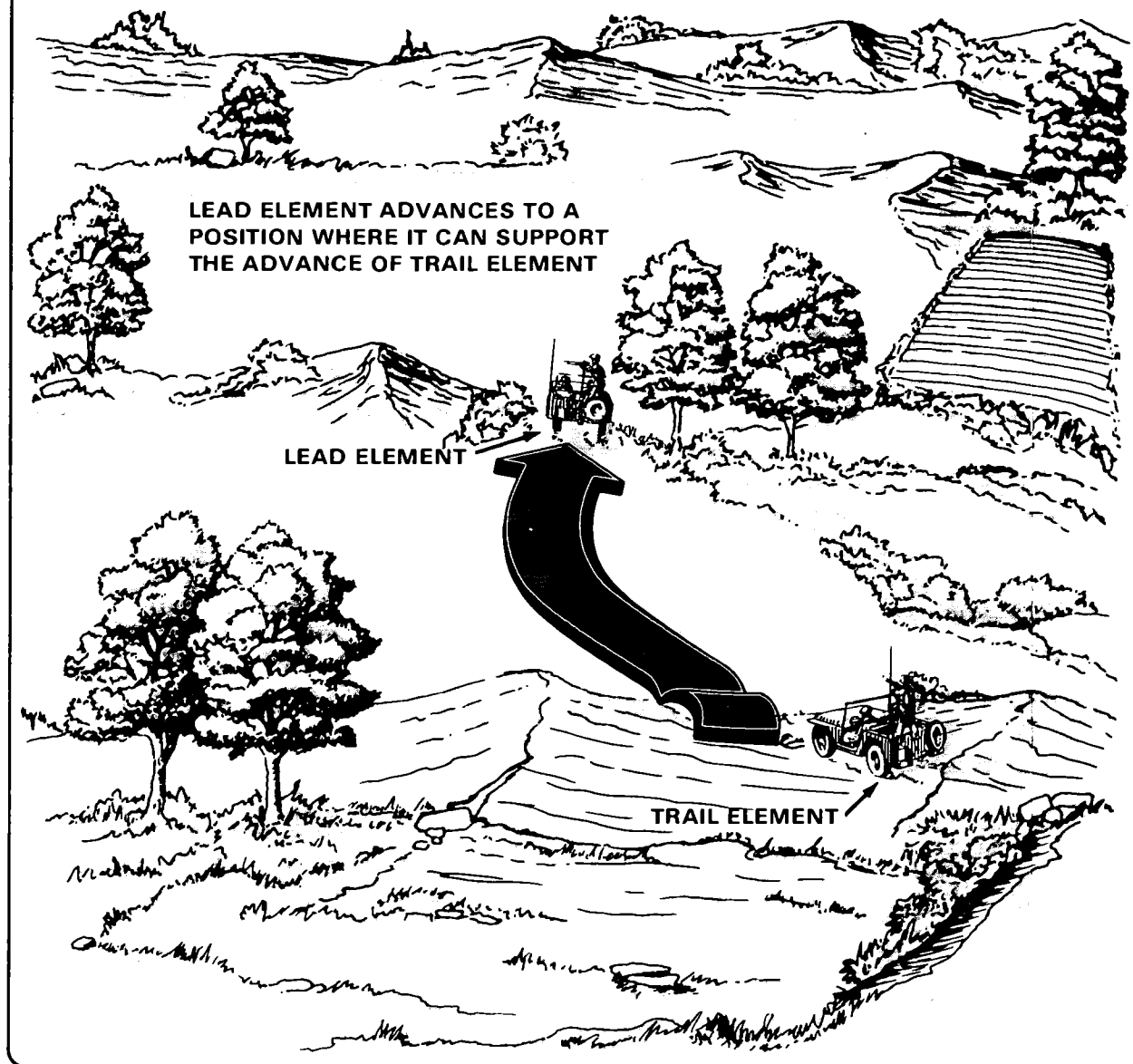
3 TWO-TEAM BOUNDING OVERWATCH TECHNIQUE STEP 2



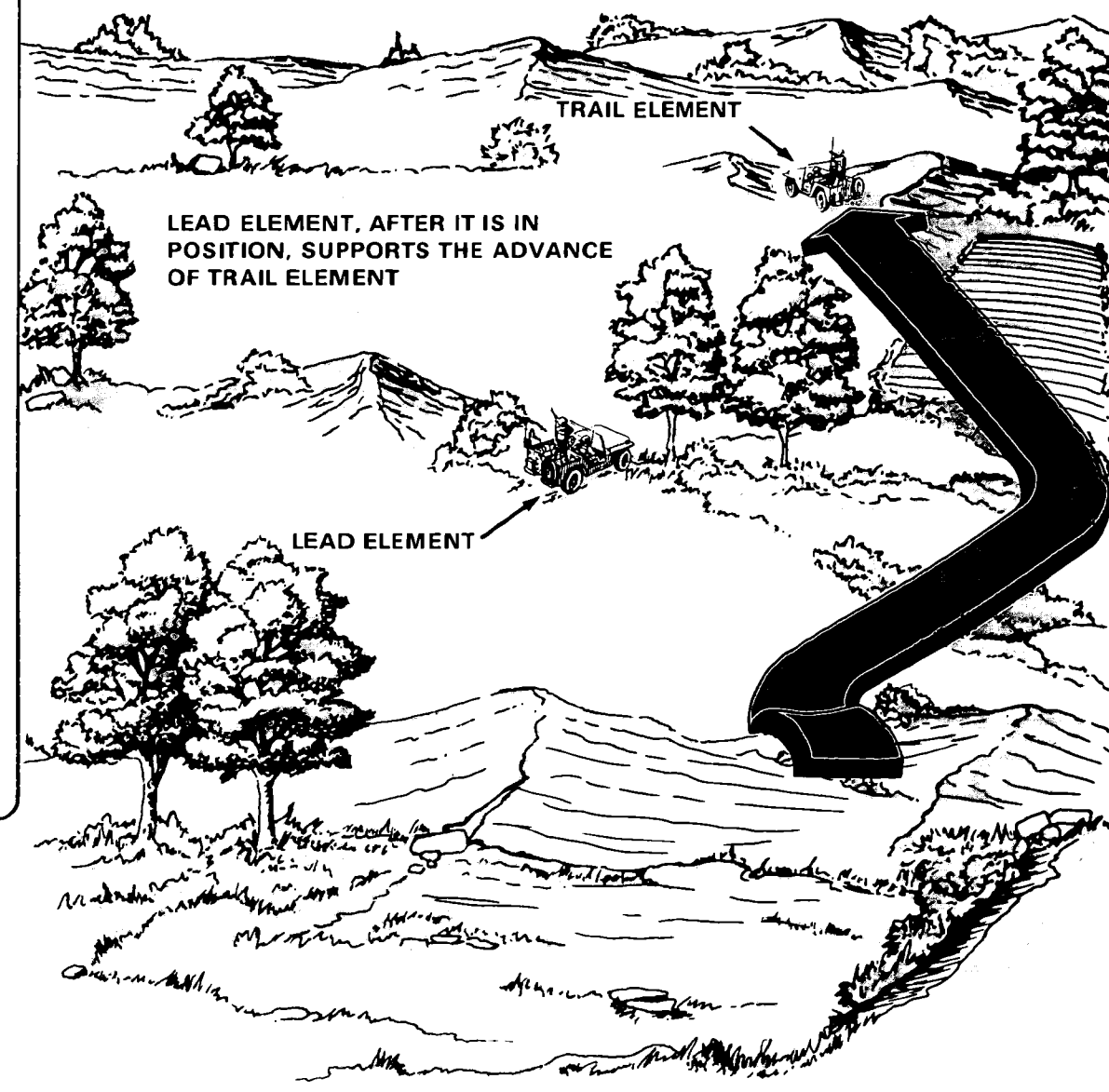
3 TWO-TEAM BOUNDING OVERWATCH TECHNIQUE STEP 3



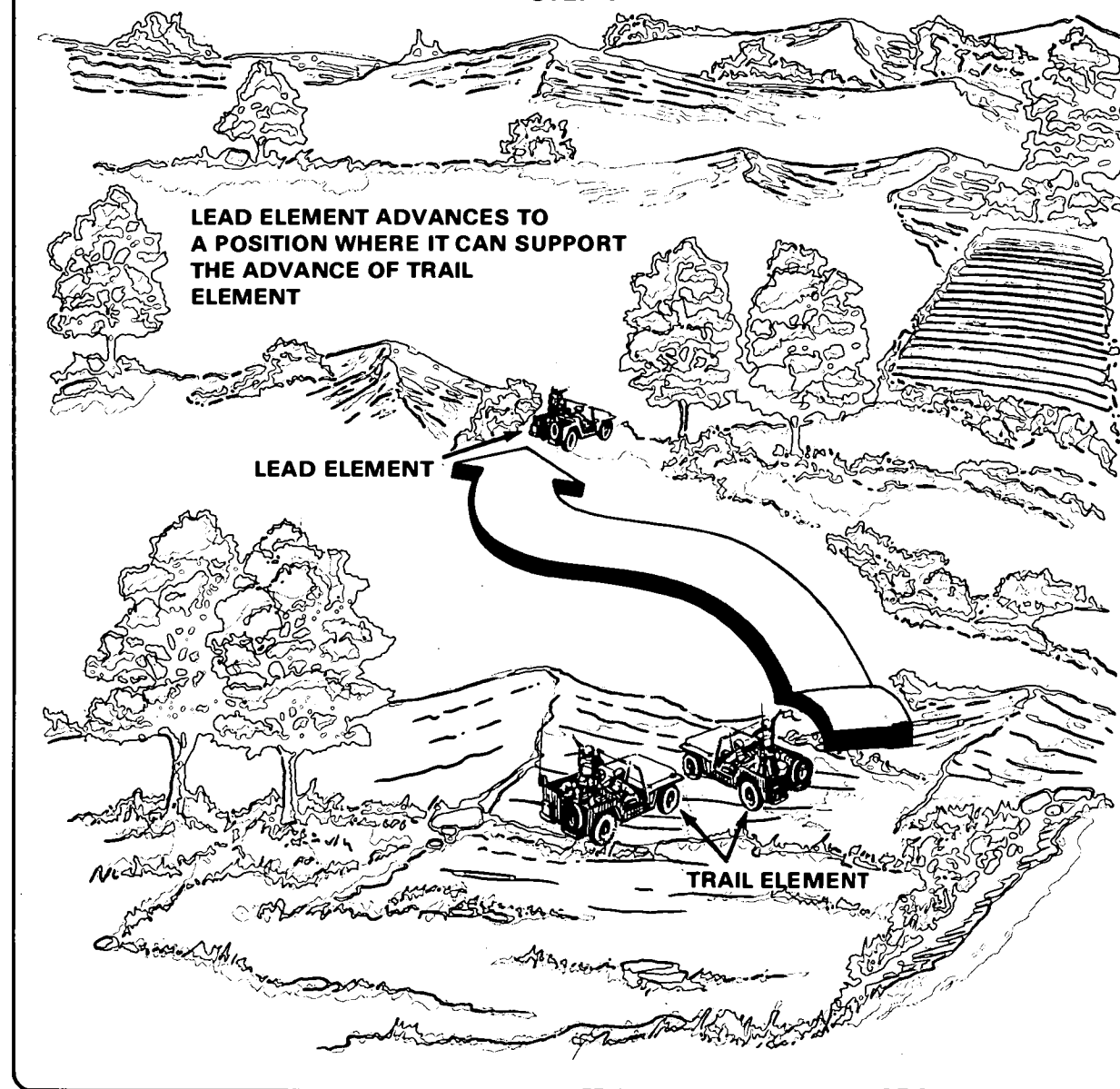
**3 TWO-TEAM BOUNDING OVERWATCH TECHNIQUE
ANOTHER WAY
STEP 1**



**3 TWO-TEAM BOUNDING OVERWATCH TECHNIQUE
ANOTHER WAY
STEP 2**

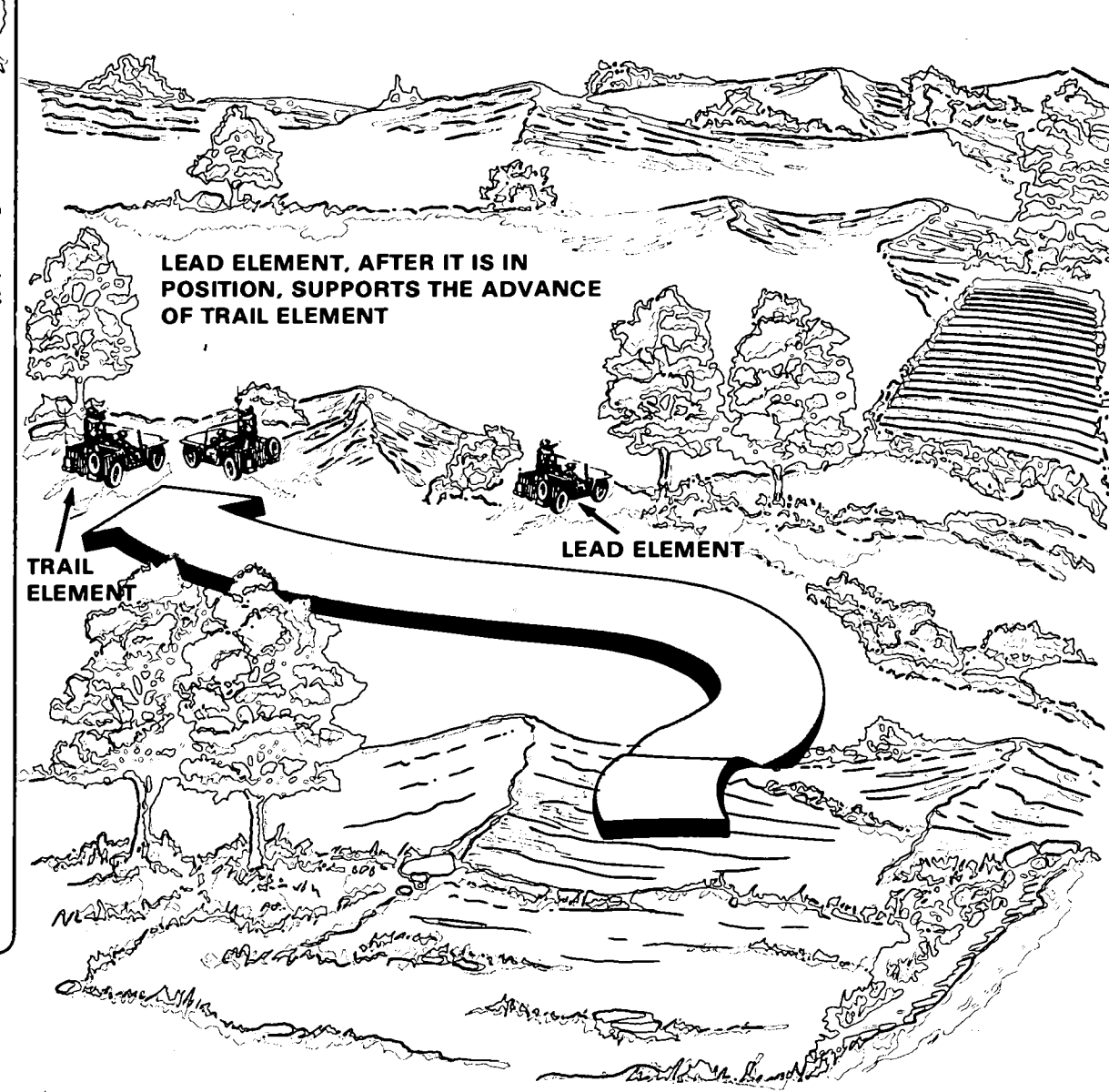


③ THREE-TEAM BOUNDING OVERWATCH TECHNIQUE
STEP 1

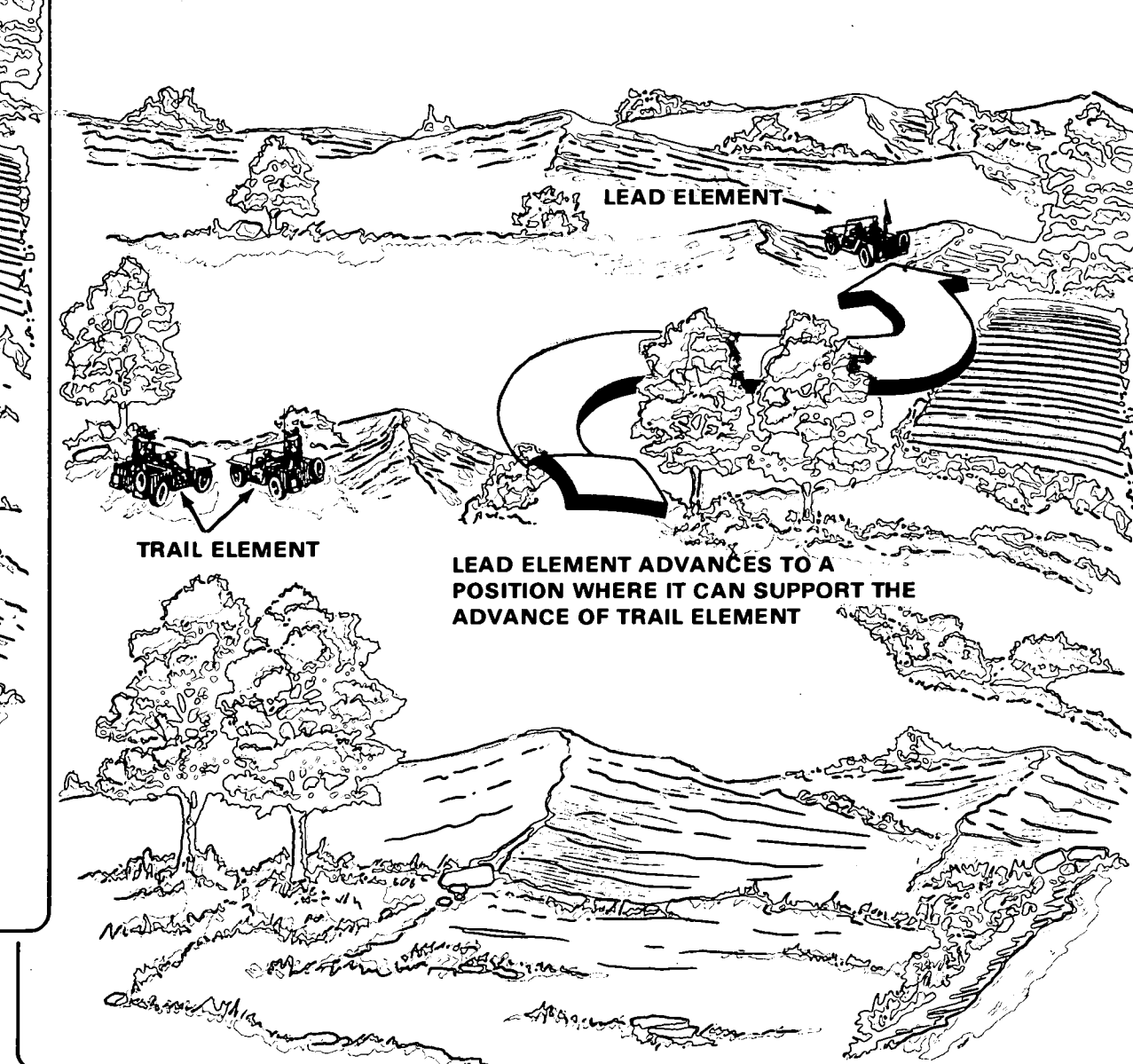


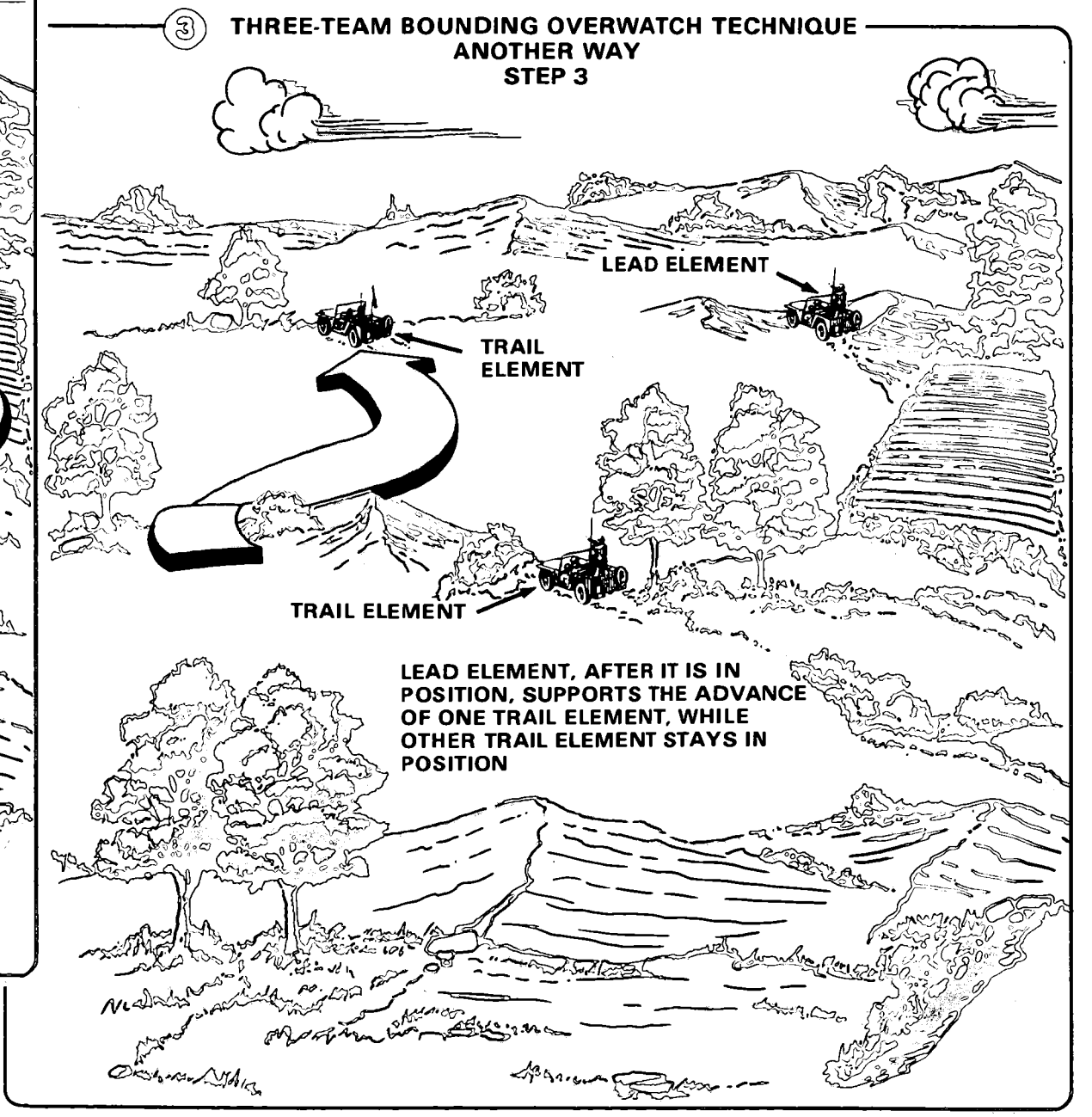
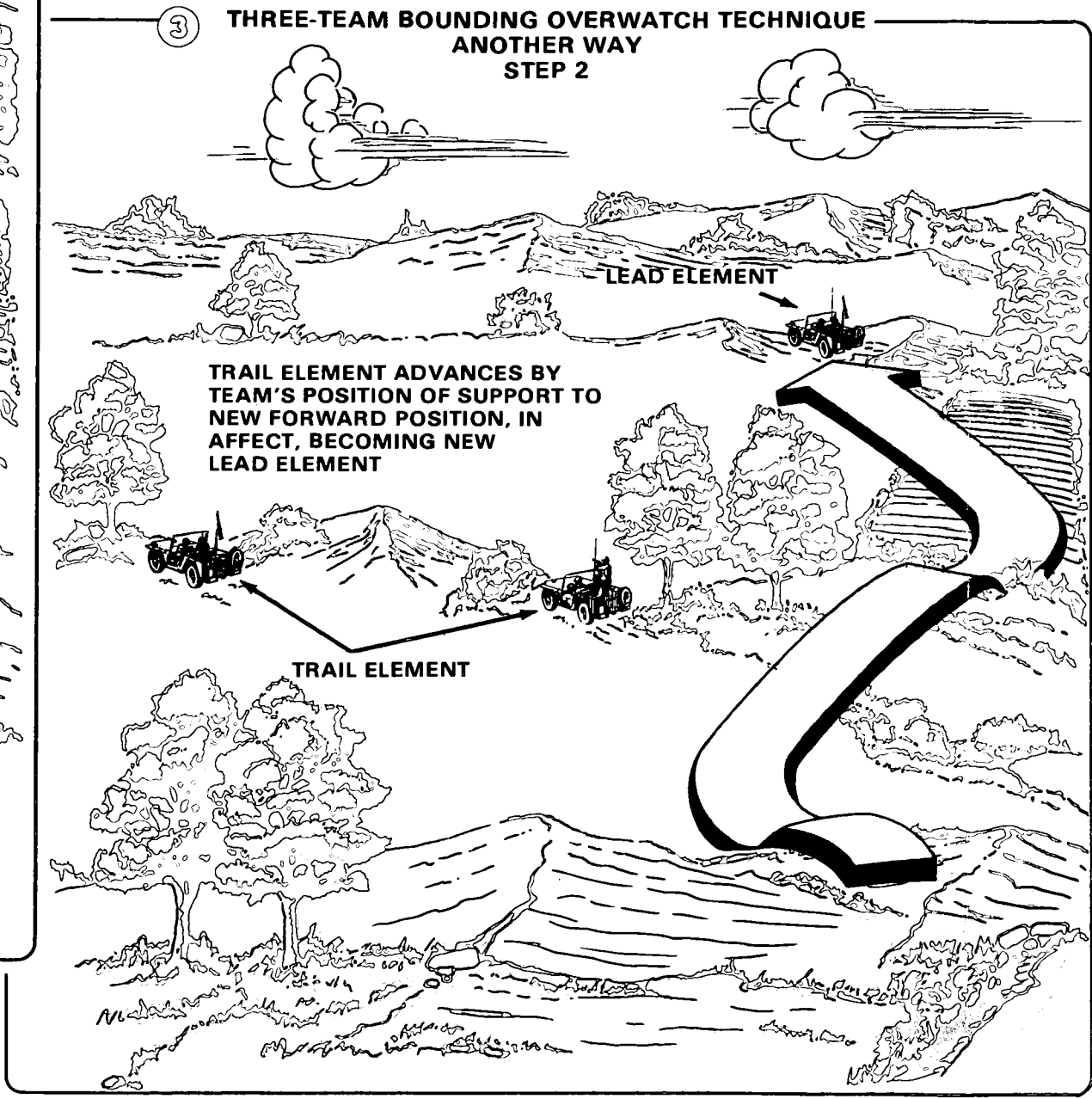
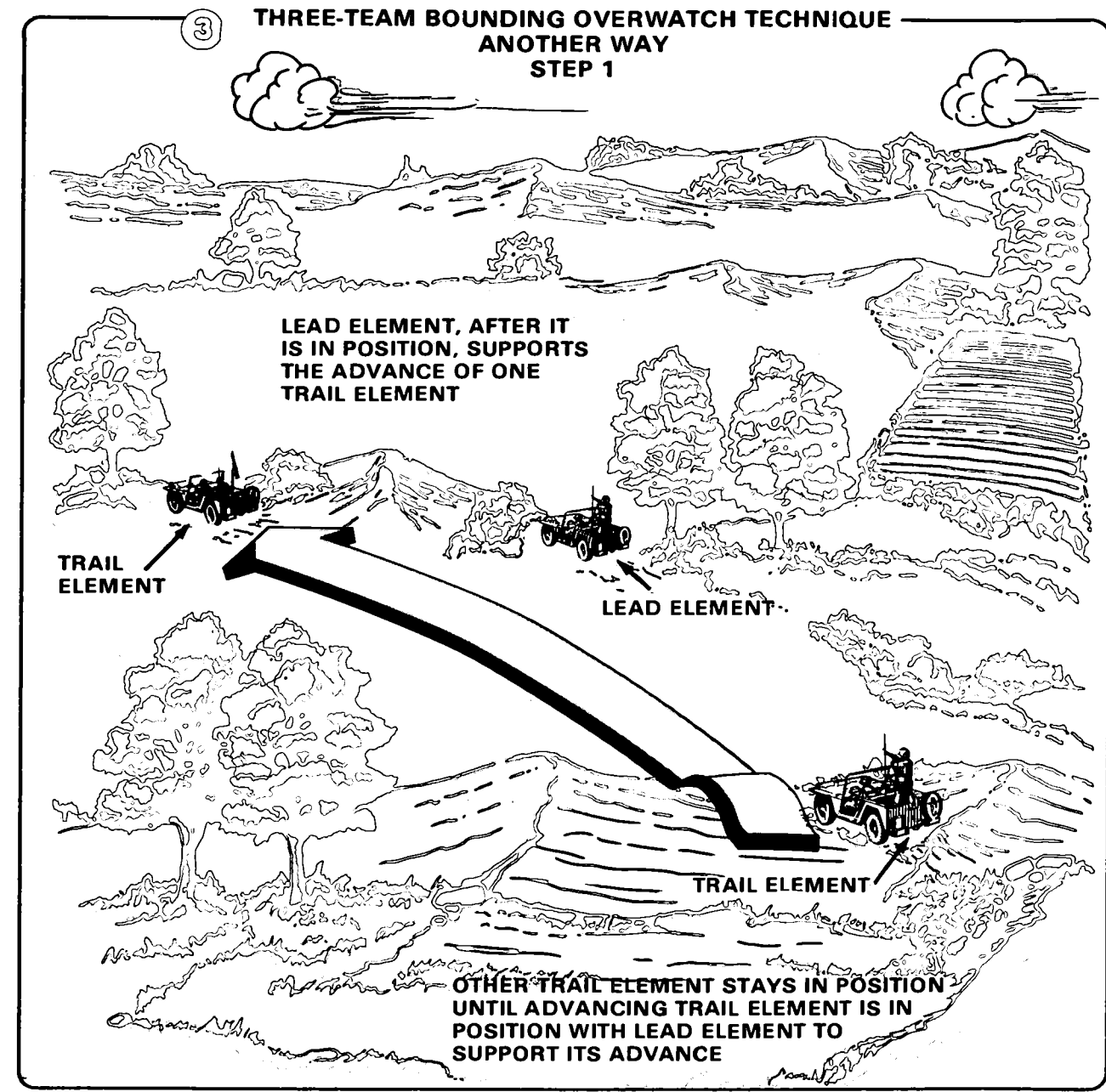
THREE-TEAM BOUNDING OVERWATCH TECHNIQUE
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③ THREE-TEAM BOUNDING OVERWATCH TECHNIQUE
STEP 2



③ THREE-TEAM BOUNDING OVERWATCH TECHNIQUE
STEP 3





RECONNAISSANCE TECHNIQUES

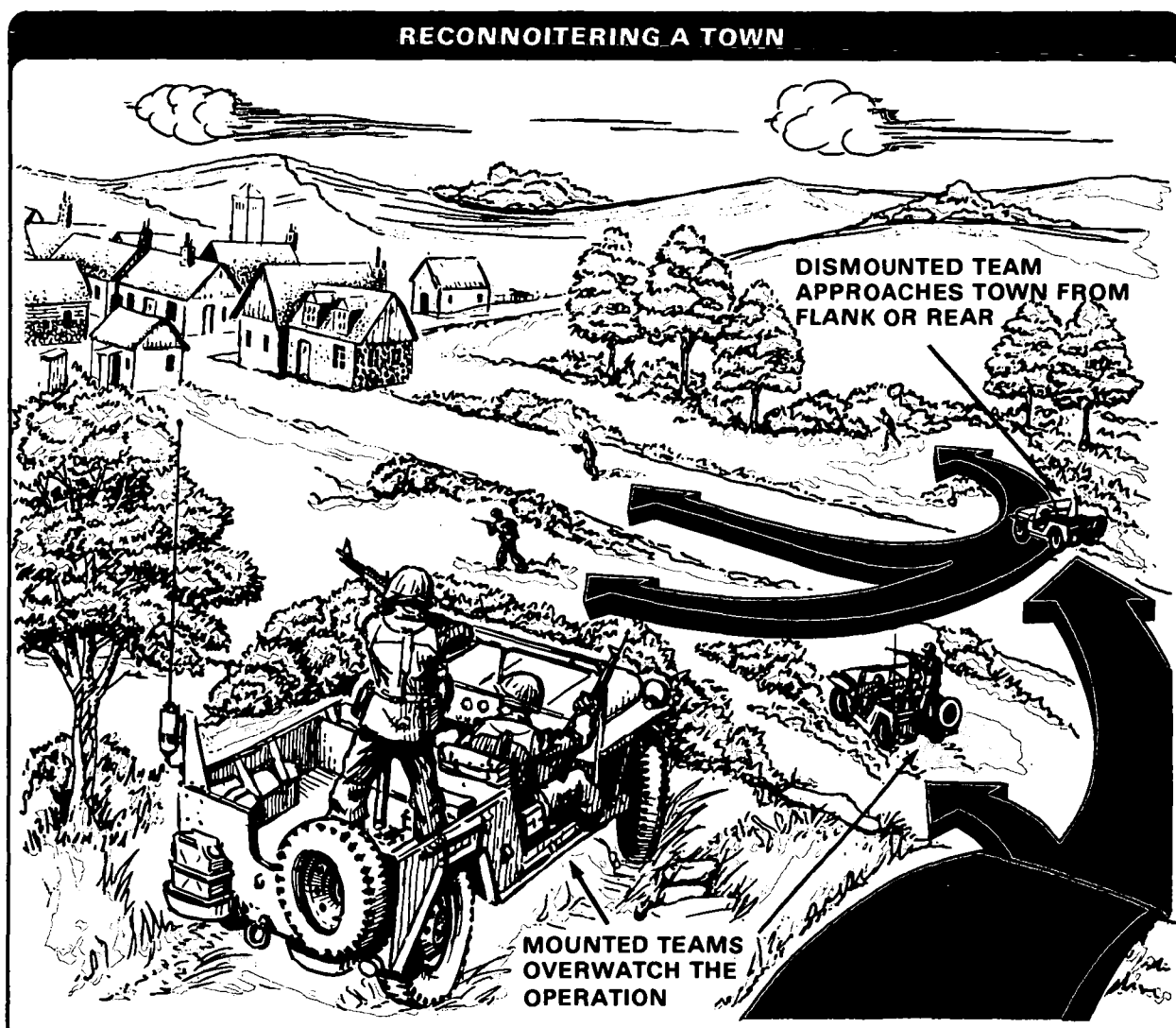
NBC reconnaissance teams must use certain reconnaissance techniques to accomplish their mission. These techniques

are centered around prominent or unusual terrain features.

Reconnoitering a Town

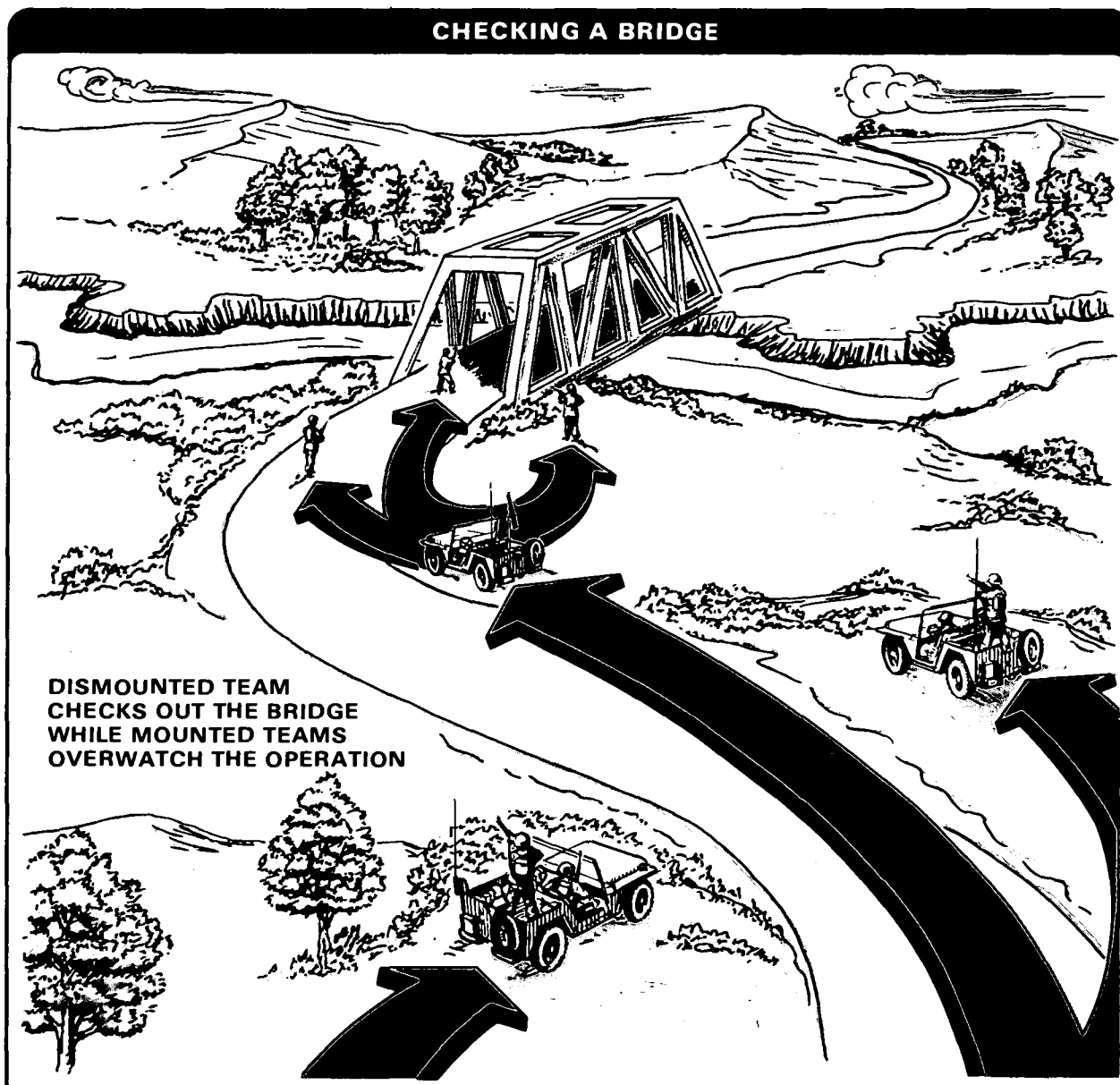
When it is necessary to reconnoiter a town, it is preferable to do so with dismounted elements overwatched by mounted elements. The town is approached from the flank or rear. *It is best to reconnoiter a town using the whole NBC reconnaissance squad or detachment.* One or two teams dismount

while the remainder of the reconnaissance element overwatches the operation. Once it is known that enemy is not in the town, the mounted element joins the dismounted element. Each team is then assigned a street or area depending on the size of the town.



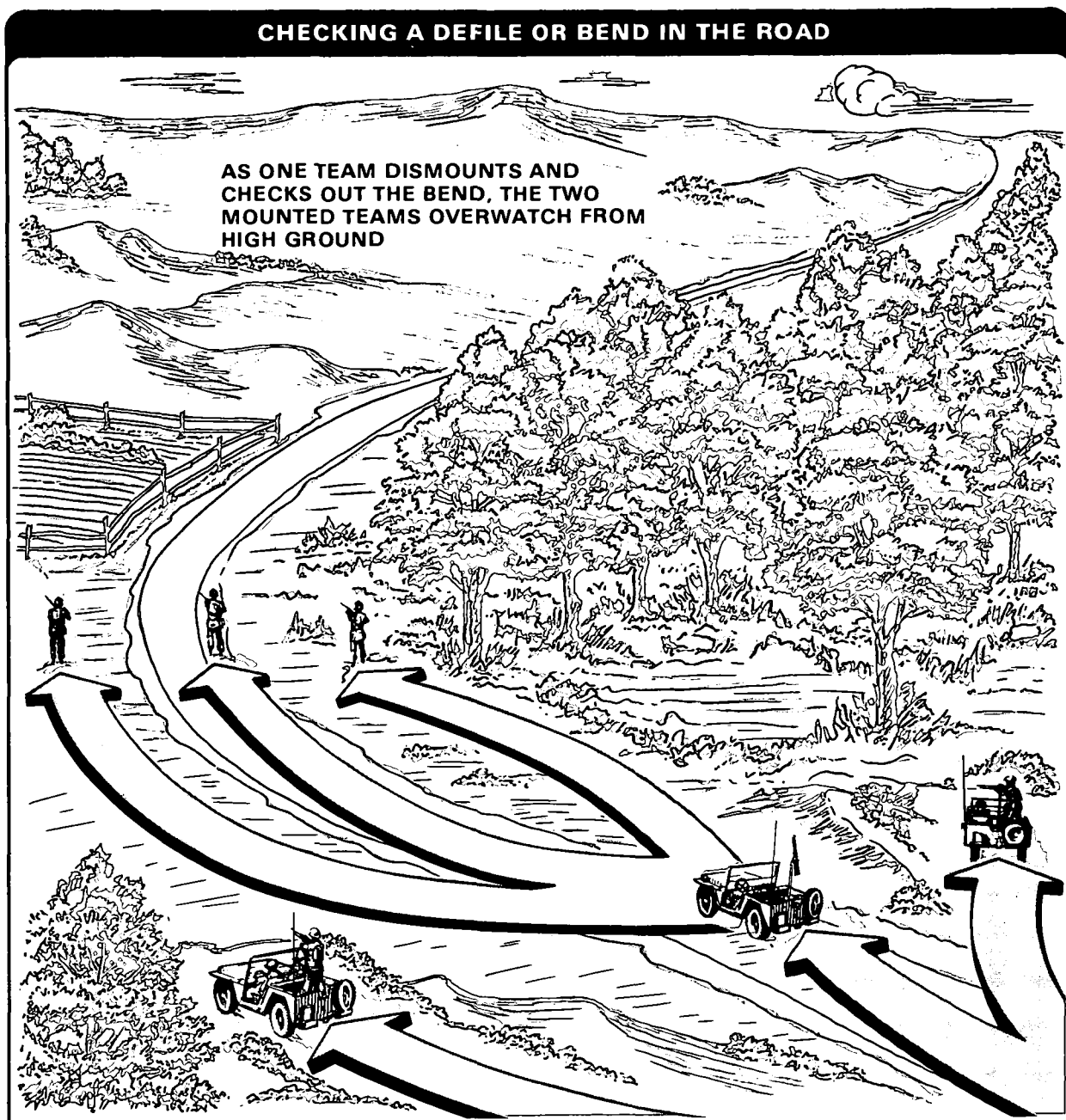
Checking a Bridge

Bridges are considered obstacles. They are often covered by enemy fire. But just as important, *bridges are usually mined, booby trapped, or prepared for demolition*. When it is necessary to cross a bridge not yet secured by friendly forces, the bridge is first checked by dismounted NBC scouts. The dismounted element is overwatched by a mounted element.



Checking a Defile or Bend in the Road

Like bridges, defiles or bends in the road may often be covered by enemy fire. Both may be mined. So here also, *it is a good idea to have dismounted NBC scouts check for mines while mounted elements overwatch from high ground nearby.*

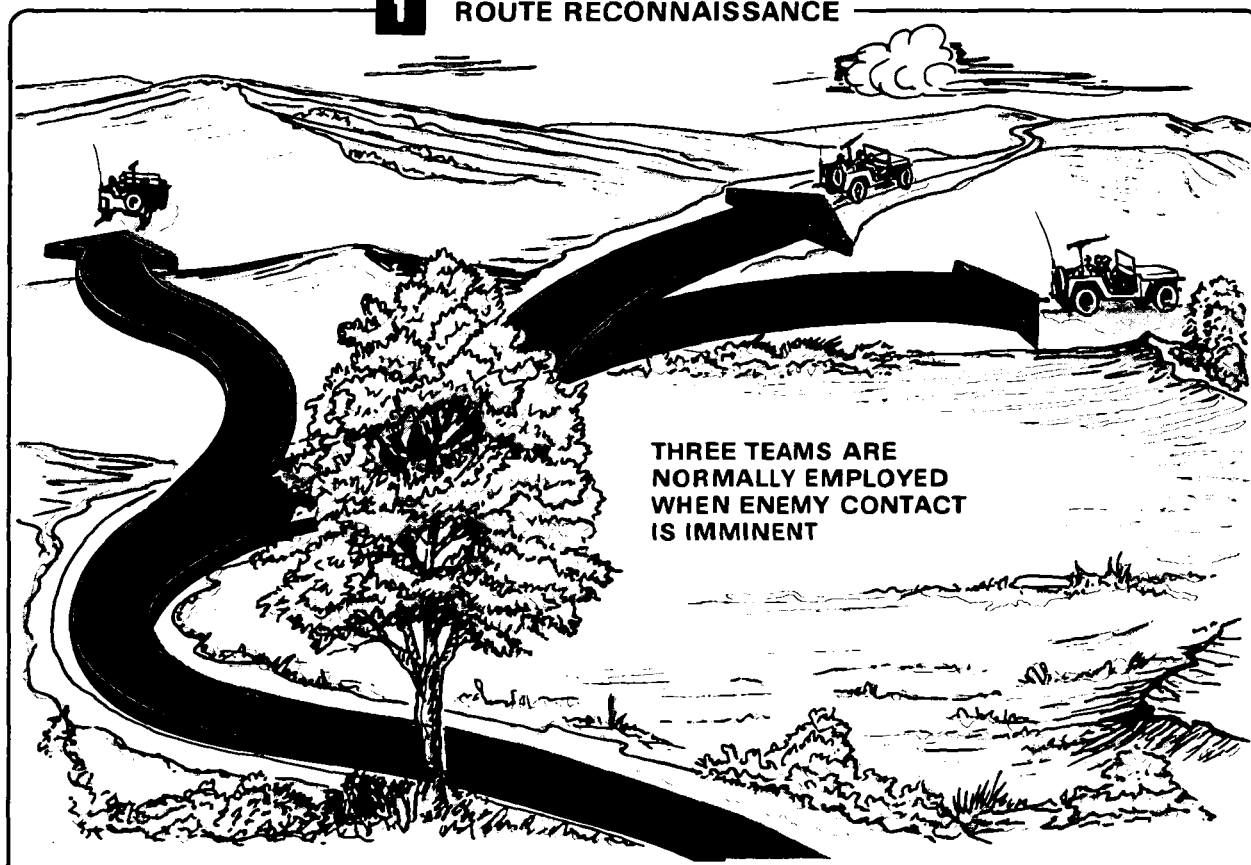


TYPES OF RECONNAISSANCE

There are three types of reconnaissance: **1** route, **2** zone, and **3** area. NBC reconnaissance units conduct NBC reconnaissance operations using these types of reconnaissance.

1 Route. A route reconnaissance is conducted to gain detailed information about a specific route and the terrain along that route from which the enemy can influence movement. Route reconnaissance missions normally follow a road or a key avenue of approach. Depending on the tactical situation, one or more three-man reconnaissance teams are assigned to a route. When enemy contact is imminent, three teams are normally employed on one route. One team may operate with other reconnaissance units as previously described.

1 ROUTE RECONNAISSANCE



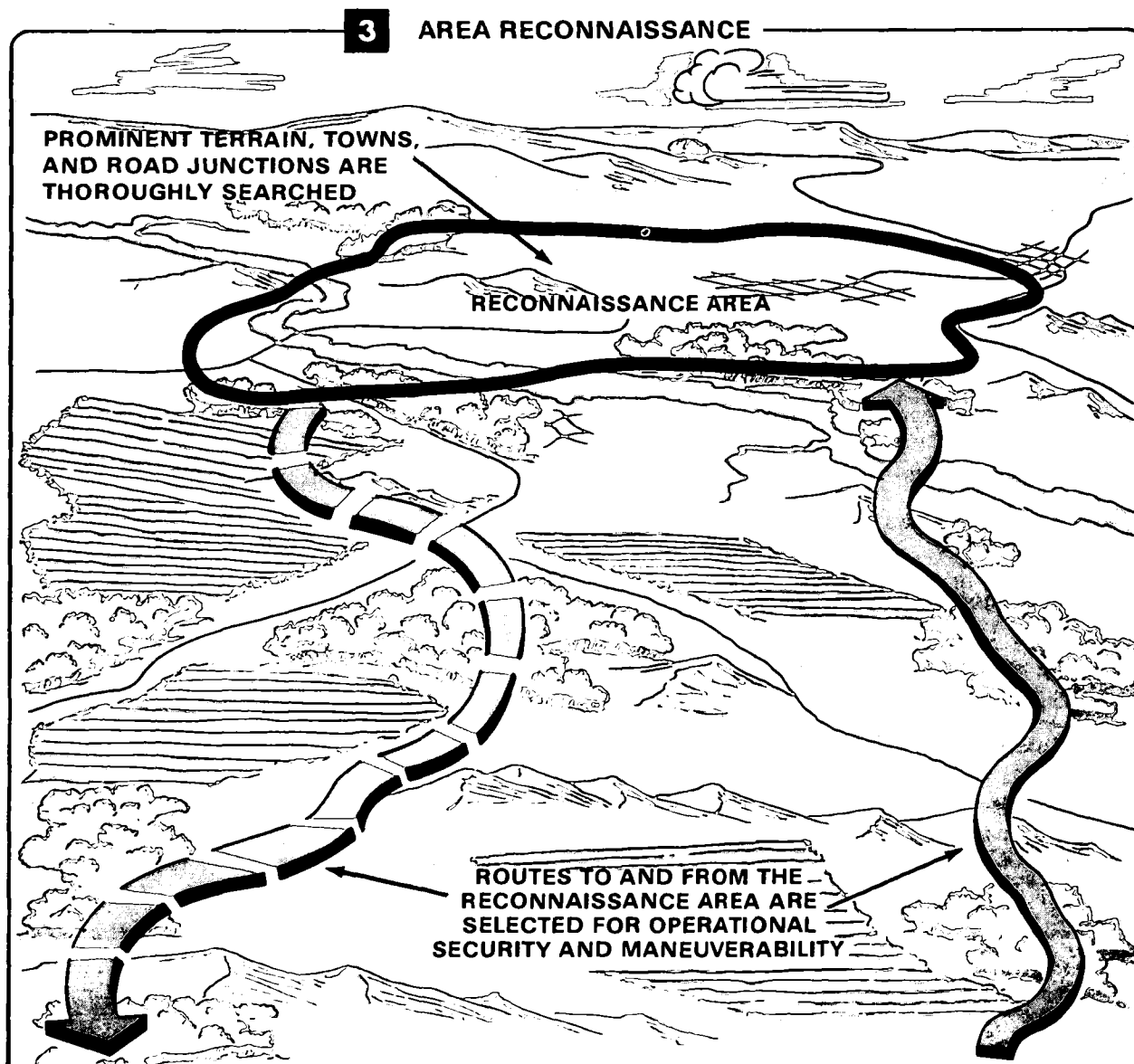
3 Area. An area reconnaissance is performed by NBC reconnaissance units to gain information about a specific area. The area is defined by an enclosed line. Prominent terrain features, towns, and road junctions within the enclosed area are thoroughly searched as in a zone reconnaissance.

Routes to the reconnaissance area are carefully selected to enhance operational security. As with route and zone reconnaissance, three teams are usually

employed together when the threat of enemy contact is high. However, one team may be used to augment other reconnaissance units. Particular attention is given to—

- Avenues of approach.
- Bridges or river crossing sites.
- Prominent terrain features.

NBC reconnaissance units should return from the objective area using a different route to avoid ambush or observation.



NUCLEAR RECONNAISSANCE OPERATIONS

Nuclear weapons can contaminate personnel, equipment, and terrain with radiation. NBC reconnaissance teams conduct route, zone, or area reconnaissance to determine the type, extent, and intensity (dose rate) of radiological contamination. If the primary mission is to determine the nature and extent of radiological contamination, the mission is called a nuclear reconnaissance mission.

NBC reconnaissance units perform their missions either on the ground or in the air. They follow the radiological survey and monitoring techniques described in FM 3-12. As with any reconnaissance operation, NBC reconnaissance teams are briefed on what they may encounter in the area (enemy activity and terrain) and what they are to report. A mission briefing should include—

- Type of reconnaissance (route, zone, area).
- Reconnaissance objective.
- Current situation in the mission area.

A typical mission briefing may be as follows:

Conduct nuclear area reconnaissance. Area is a chokepoint. We have received three fallout producing nuc strikes. Report any reading over 35 RAD/hr. Mark side of road at 50 RAD/hr. Turnback dose rate 70 RAD/hr. Turnback dose 60 RAD. Need reading at this bridge (UH 784568). Decon point at UH935456. No departures from standing operating procedures (SOP).

AN EXAMPLE OF
A NUCLEAR AREA
RECONNAISSANCE MISSION

A division is in a defensive position with three brigades abreast. The second brigade, located in the center, has an NBC defense platoon attached to it. The brigade commander directs the NBC defense platoon to conduct a ground reconnaissance of a chokepoint **A** that has been contaminated by nuclear surface bursts. A ground mission is necessary because an enemy air defense threat prevents aerial reconnaissance.

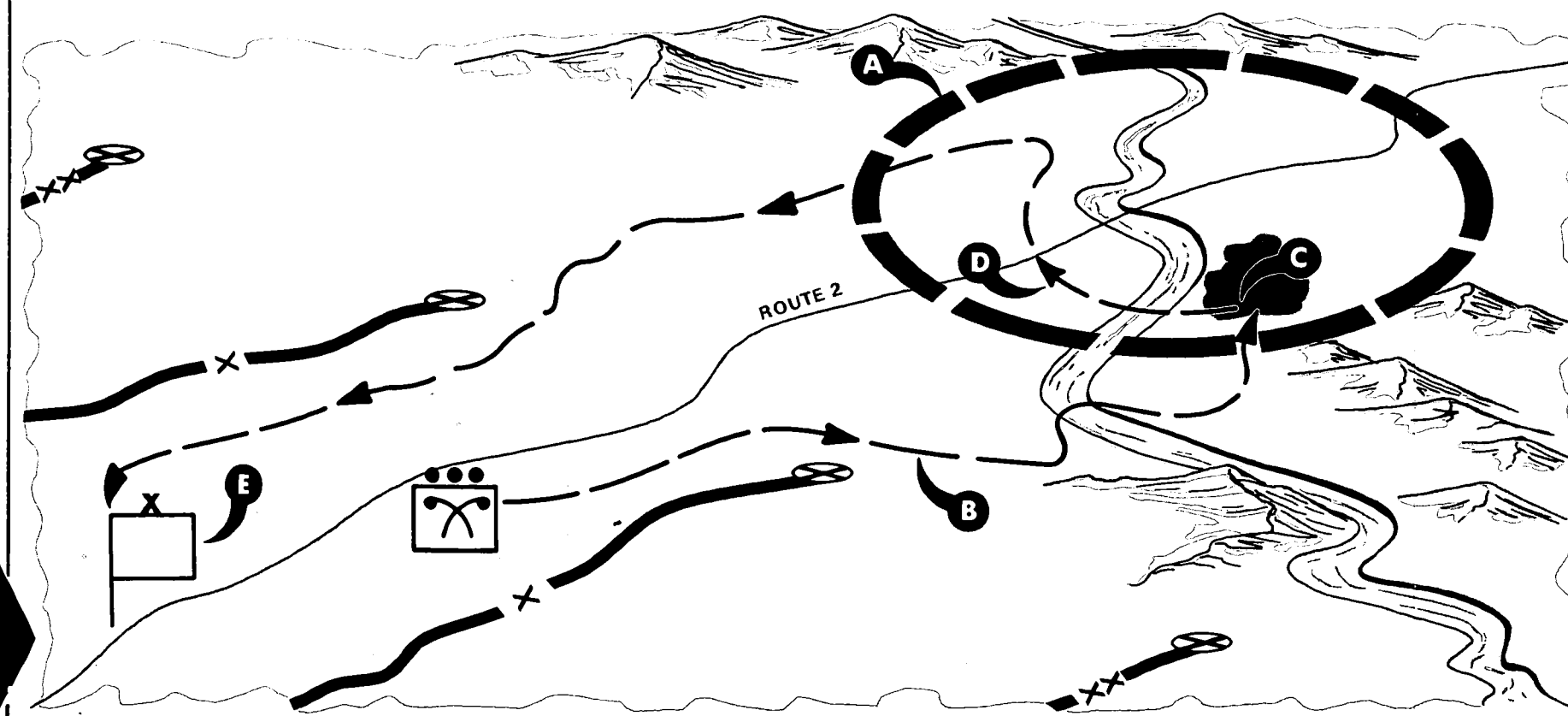
Upon receiving the mission, the platoon leader briefs his reconnaissance squad. The squad leader then follows the troop leading procedures described in chapter 2. He checks the equipment and begins the mission. The squad starts monitoring with the IM-174 series high intensity gamma radiacmeter. The monitoring

continues for the entire mission. The squad moves by concealed routes **B** and uses traveling overwatch because enemy contact is possible. Reconnaissance teams, however, stay in their vehicles to cut down on radiation exposure.

Soon after the mission begins, the squad encounters an area **C** where the maximum acceptable dose rate is reached. The squad leader submits a spot report to brigade headquarters and evaluates the situation. Due to the radiation hazard, the squad leader selects an alternate movement route **D** and reports this route to brigade headquarters.

The reconnaissance squad then completes the mission and returns to the brigade command post **E**. Here, both personnel and equipment are monitored using an AN/PDR-27 series radiacmeter and decontaminated as described in chapter 4. In addition, tactical dosimeters are read and the associated radiation exposure readings are reported through channels, using the procedures in FM 3-12.

The brigade and supported unit chemical officers analyze the nuclear reconnaissance information. They then determine the hazards for subordinate units and, together with the operations officer, develop alternatives that reduce the hazards without jeopardizing the mission.



Nuclear reconnaissance operations can also be conducted from rotary or fixed wing aircraft. Aircraft are often used when—

- Speed is important.
- Reconnaissance by ground vehicle is difficult.
- Radiation dose rates are so intense that ground reconnaissance is not practical.

The aircraft are provided by divisional or corps aviation units. NBC scouts conduct radiological monitoring from the aircraft as pilots fly predetermined course legs that are planned by the NBC element. These procedures are discussed in chapter 2 and FM 3-12.

BIOLOGICAL RECONNAISSANCE OPERATIONS

When biological weapons are used, biological reconnaissance is necessary to identify the type of agent and to estimate the size of the contaminated area. Normally, teams receive zone or area reconnaissance missions because biological weapons cover a large area.

Commanders usually order biological reconnaissance when unexplained illnesses occur or when biological dissemination equipment is detected. Since reconnaissance elements cannot identify biological agents, they take samples. Later, the samples are identified by medical laboratory units operating with the corps support command (COSCOM).

Biological reconnaissance mission orders should include the following:

- Specific area or point at which attack indicator was observed.
- Type of indicator observed.
- Current situation in mission area.
- Any departure to be made from SOPs.

Before assigning biological reconnaissance missions, staff chemical officers coordinate with the command surgeon. They do this to determine if the nature and extent of the contamination have not already been identified in recent medical cases. If biological reconnaissance is necessary, the reconnaissance unit leader uses the troop leading procedures discussed in chapter 2.

**AN EXAMPLE OF
A BIOLOGICAL AREA
RECONNAISSANCE MISSION**

Divisional air defense units sight an enemy aircraft releasing an unknown spray in the center brigade support area **A**. Chemical agent alarms are not activated, so the division commander suspects biological contamination. Since the area is large and time is critical, all of the reconnaissance squads of the division's NBC defense company are ordered to conduct biological reconnaissance. They are under the operational control of the NBC defense platoon leader supporting the center brigade.

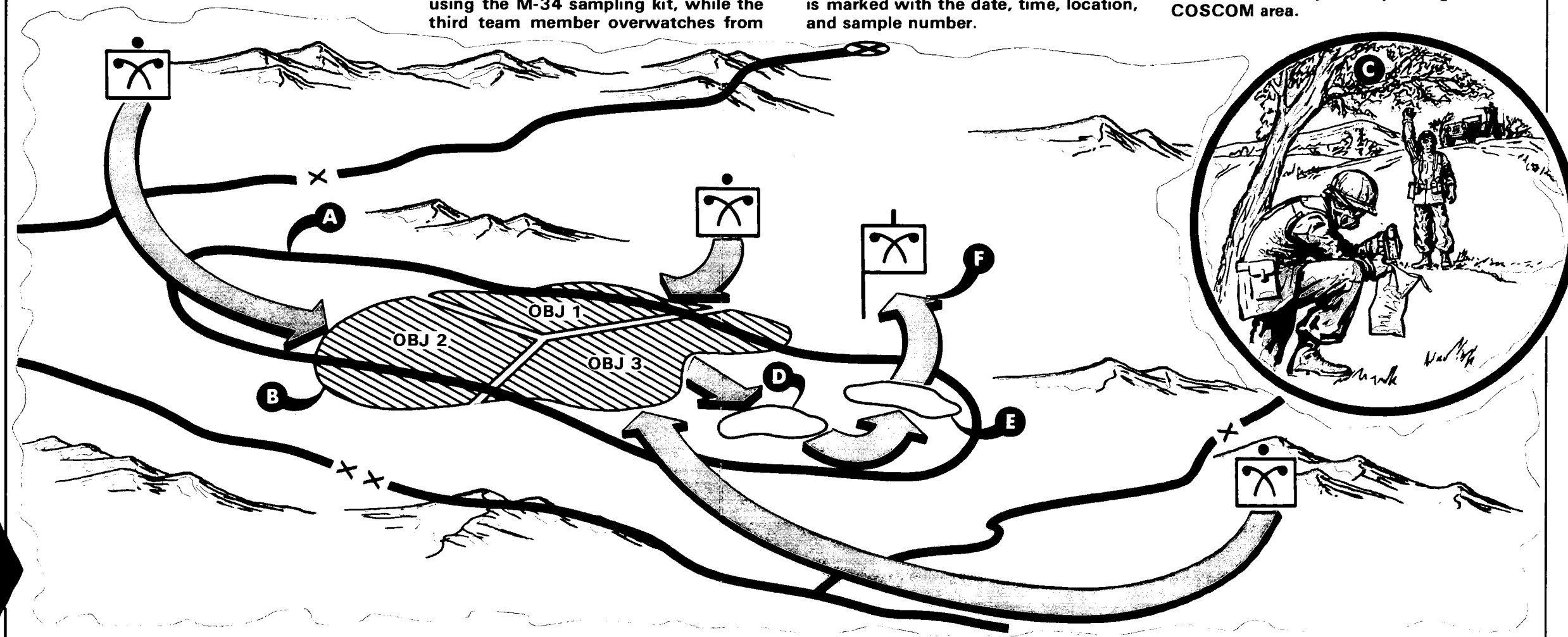
Each reconnaissance squad moves to the objective area **B**. The area is divided into three sectors to speed up the mission. Upon arrival at the objective area, each NBC reconnaissance squad is assigned a specific area or route by the platoon leader of the NBC defense platoon. Squad leaders, in turn, assign areas or routes to each of their teams.

Reconnaissance NCOs lead their teams to specific areas. There, each team conducts a similar operation. Two of the NBC scouts dismount and take samples using the M-34 sampling kit, while the third team member overwatches from

the vehicle with the pedestal-mounted machinegun **C**.

The dismounted element moves as close to the point of agent release as possible. For sampling, the scouts select shady or protected areas that have not been flushed by rain or ground water. One NBC scout takes swabs of moisture from vegetation. The other scout collects samples of water and munition fragments. (The techniques for securing biological samples are found in the proper Soldier's Manuals.) Each sample is marked with the date, time, location, and sample number.

Additional samples are collected until the mission is complete. Then, all the teams return to a prearranged location **D** and move, as a unit, to a combined personnel and equipment decontamination station **E**. After decontamination is completed, the reconnaissance teams return to the controlling headquarters **F** and are debriefed according to SOP. Exteriors of sample containers are decontaminated with hot, soapy water. Containers are then evacuated through combat service support channels to medical laboratory units operating in the COSCOM area.



CHEMICAL RECONNAISSANCE OPERATIONS

NBC reconnaissance units conduct chemical reconnaissance operations to identify type and extent of the hazard. Before the mission, the reconnaissance unit is briefed on the following:

- Areas to be reconnoitered.
- Current situation in the mission area.
- Critical reconnaissance points.
- Requirements to mark contamination.
- Location of after-mission decontamination point.

AN EXAMPLE OF
A CHEMICAL ROUTE
RECONNAISSANCE MISSION



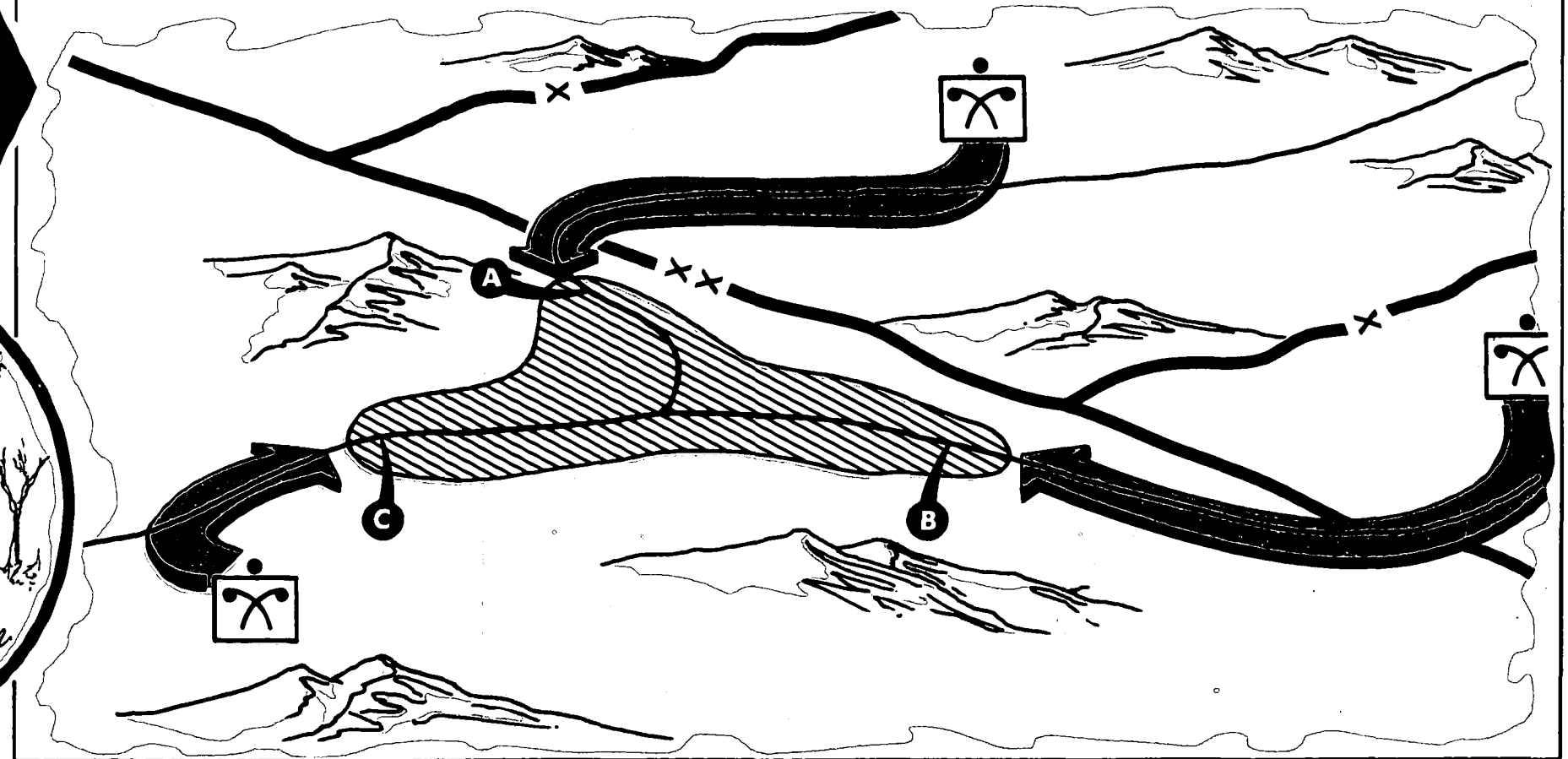
Main supply routes (MSR) 1, 1a, and 1b are contaminated by a chemical agent, delivered by enemy rocket launchers. Two NBC defense platoons, under the operational control of the center and right brigades, are ordered to conduct a chemical route reconnaissance along MSR 1a (A) and 1b (B). A reconnaissance squad from the COSCOM's NBC defense company is to reconnoiter MSR 1 (C).

Platoon leaders brief their reconnaissance squad leaders. Squad leaders follow the troop leading procedures in chapter 2. The mission starts with three, three-man teams deployed on each route: one on the MSR and one on each

flank to search adjacent terrain. The teams continuously sample the air with the automatic chemical agent alarm system.

One by one the teams dismount (D) as their alarms activate. They then conduct a similar sampling operation to determine the type of contamination. One NBC scout stays in the vehicle and works the pedestal-mounted machine-gun while the other team members dismount and look for the contaminant. The reconnaissance NCO selects the area to be searched. The other NBC scout operates the chemical agent detector kit. The reconnaissance NCO

directs his attention to shell craters, low-lying patches of woods, defiles, ravines, and areas covered with high grass or underbrush. The scouts also check water sources for chemical contamination using the chemical agent water testing kit. They then mark the area, service the automatic chemical agent alarm, mount their vehicle, and move to another location to determine the extent of contamination. While moving, the reconnaissance NCO sends an NBC-1 (chemical) report. The team then continues to sample vegetation and terrain for liquid contamination. When doing this, they use chemical agent detector paper.



**FOLD THIS OUT FOR
CHEMICAL RECONNAISSANCE OPERATIONS**

DECONTAMINATION SITE RECONNAISSANCE OPERATIONS

Whenever nuclear, biological, or chemical weapons are used, *decontamination operations must be conducted before individual and unit protective measures can be reduced or canceled*. Complete decontamination operations are conducted at personnel, equipment, or combined personnel and equipment decontamination stations. These stations are operated by NBC decontamination units as described in chapter 4. Partial decontamination operations are done at hasty decontamination sites run by NBC decontamination units. Both hasty and complete decontamination sites are selected using the same procedures. However, hasty sites are normally located closer to the contaminated unit because speed is important.

The brigade chemical officer coordinates with the brigade operations and intelligence officers to select potential decontamination sites by map reconnaissance. The staff surgeon insures that the prepared sites satisfy preventive medicine and environmental conditions. NBC reconnaissance units then check the area to insure that these are suitable sites.

**DECONTAMINATION SITES
ARE ALWAYS SELECTED
FROM "CLEAN" AREAS**

During the mission, the reconnaissance unit leader follows troop leading procedures. Usually, two or more reconnaissance teams move to the objective area. Prominent terrain features within the objective area are completely searched and checked for nuclear and chemical contamination. The decontamination station is always located in an area free of contamination. The reconnaissance NCO selects the "clean" area. He then directs the team to adequate water sources since thousands of gallons of water are used during decontamination operations. The reconnaissance NCO also looks for wooded areas or large buildings that provide cover and concealment. If these concealed areas are not close to water sources, water may be pumped to the site. Smoke may also be used to help conceal decontamination sites.

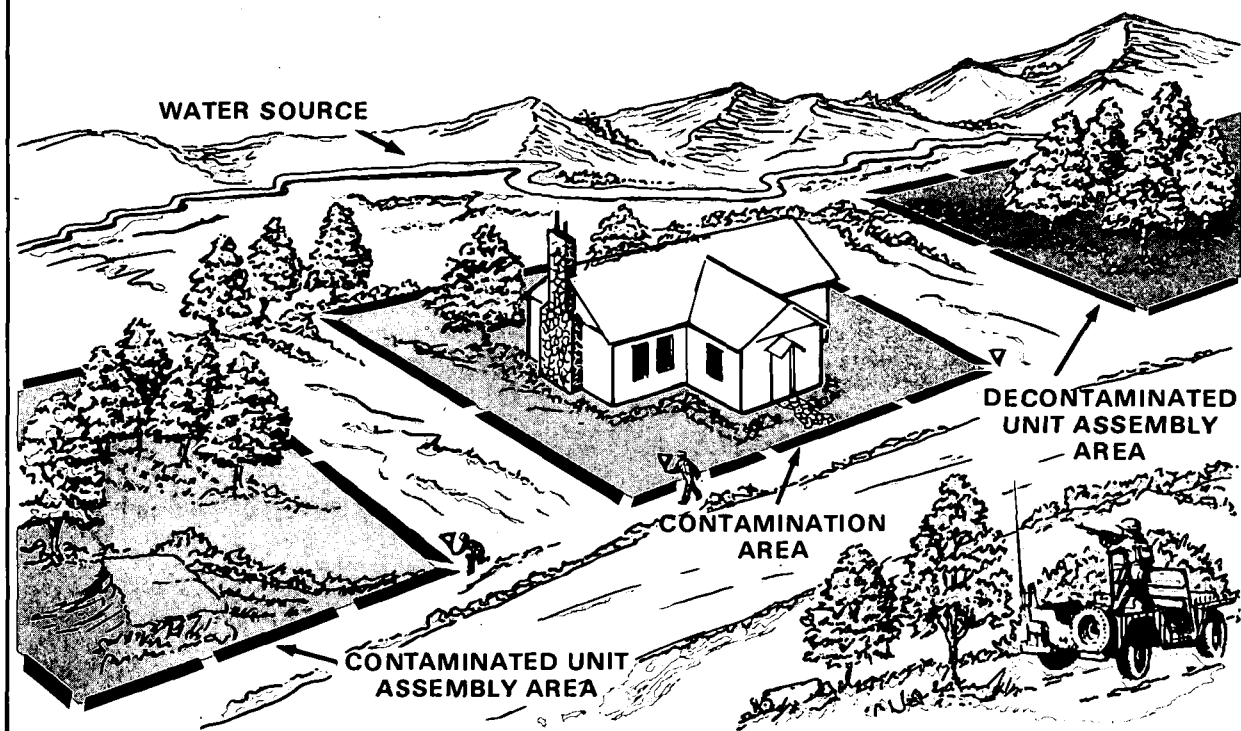
During the search, two team members dismount while the other overwatches with the pedestal-mounted machinegun. Dismounted NBC scouts select and mark tentative stations. Each station is reserved for a different type of decontamination operation. The scouts then select and mark potential assembly areas. One assembly area is selected downwind from the decontamination station. It is used for contaminated soldiers and equipment. The other one is selected upwind from the decontamination station. This one is occupied by the

contaminated unit after decontamination operations.

The NBC reconnaissance unit directs decontamination units to their operational areas. If time permits, NBC reconnaissance units may stay in the area to guide contaminated units through the decontamination site. If they are contaminated and time permits, they may also process through the decontamination station before beginning their next mission.

SELECTION AND MARKING OF DECONTAMINATION SITE

AFTER THE AREA IS FOUND TO BE FREE OF CONTAMINATION, TWO TEAM MEMBERS DISMOUNT, OVERWATCHED BY THE THIRD MEMBER—WOODED AREAS AND LARGE BUILDINGS ARE MARKED AS TENTATIVE STATIONS, WATER SOURCES ARE LOCATED, AND EACH TYPE OF DECONTAMINATION AREA IS MARKED



RECONNAISSANCE AT NIGHT AND DURING OTHER PERIODS OF REDUCED VISIBILITY

NBC reconnaissance elements conduct operations at night just as they do during the day. However, the rate of coverage is less than in one day. This is due to an increase in navigational difficulties; a reduction in visual observation; and during sustained operations, a decline in human endurance. As a general rule, routes can be searched just as well at night as in the day, although not as quickly. When conducting a zone reconnaissance, zones should be narrowed since command and control is more difficult at night. When performing an area reconnaissance at night or during other periods of reduced visibility, the commander should also allow more time to accomplish the mission.

Illumination flares, passive night vision devices, surveillance radars, and other night observation devices offset the problems of darkness to a large degree. When illumination flares are used, they must be placed behind the enemy to silhouette him against the light. Since the enemy also uses night observation devices and places great emphasis on limited visibility operations, NBC reconnaissance units must use terrain—good cover and concealment—during reduced visibility just as they do during good visibility. They must also use dismounted reconnaissance techniques to prevent unnecessary vehicle losses. At night or in fog, the location of moving vehicles is easy to pinpoint by sound.

CHAPTER 4

Nuclear, Biological, and Chemical (NBC) Decontamination Operations

INTRODUCTION

NBC contamination causes casualties and restricts the use of equipment, terrain, and structures. Decontamination operations reduce or eliminate these hazards and permit units to continue with their mission. NBC decontamination units, other units, and individual soldiers decontaminate only when it is necessary to accomplish their mission.

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TYPES OF DECONTAMINATION

There are three types of decontamination. Each is explained below.

1 *Emergency decontamination* is done to remove and neutralize chemical contaminants from the body. It must be performed within 1 minute after contamination in order for the individual to survive. Emergency decontamination procedures are described in TM 3-220.

2 *Partial decontamination* is done to remove gross amounts of NBC contaminants from weapons, combat vehicles, and individual clothing and equipment. Contaminated personnel remove chemical and biological contaminants using personal decontamination kits and portable decontamination apparatuses assigned to vehicles. Radiological contamination is removed by brushing, sweeping, or shaking away dust and debris.

Partial decontamination, conducted by contaminated units, is described in TM 3-

220. NBC decontamination units conduct partial decontamination of equipment to help contaminated units do a faster and better job. These procedures are described later in this chapter.

3 *Complete decontamination* is conducted by specialized decontamination units so that troops do not have to wear complete NBC protective equipment. In other words, it reduces the NBC contamination hazard to a level which allows soldiers to operate at a lower mission oriented protective posture (MOPP). This, of course, lessens heat stress and equipment operational difficulties caused by the wearing of protective clothing. Since decontamination units do not have enough people and equipment to support all units, help is required from supported units. Complete decontamination operations are described later in this chapter.

THE CONTAMINATED BATTLEFIELD

If NBC weapons are used, many units and large amounts of terrain can become contaminated in a short period of time. Survival in this environment depends on two things. One is quick identification of

contaminated areas and units. The other is the ability of the individual soldier to protect himself against NBC contamination until some form of decontamination is possible.

Chemical and Biological (CB) Contamination

When CB warfare is expected, soldiers should wear protective overgarments as their standard combat uniform. Unit leaders determine the appropriate degree of individual protection. Guidelines are found in FM 21-40 and standing operating procedures. Soldiers contaminated by CB agents perform emergency skin and partial personal equipment decontamination using individual decontamination kits. Complete CB personnel decontamination is conducted by NBC decontamination units when the tactical situation permits.

Operators partially decontaminate selected areas of their equipment by spraying with a decontaminant. To do this, they use portable decontamination equipment or field expedients as described in TM 3-220. NBC decontamination units help to partially decontaminate large items of equipment by conducting decontamination operations at hasty sites when the time and situation permit. Complete decontamination operations are then easier at a later time. Or, they may not even be necessary.

Radiological Contamination

Units exposed to initial radiation must first identify the intensity (dose rate) of residual or induced radiation using radiacmeters. They then send NBC-4 contamination and radiation dose status reports through command channels. Commanders identify units that exceed the operational exposure guidance. They decide whether to withdraw these units and conduct decontamination operations or to continue with the mission.

Soldiers contaminated by radioactive dust or debris perform partial decontamination by brushing, wiping, and shaking their bodies and gear. As the mission permits,

they further reduce radiation exposure by occupying armored vehicles, bunkers, or foxholes.

Highly contaminated vehicles and major weapon systems that pose a hazard are partially decontaminated. This procedure limits the spread of contamination to other areas and reduces radiation hazard. *Early decontamination is necessary to cut down on the cumulative effects of radiation.* Without quick decontamination, small but frequent exposure to radiation may significantly reduce combat power when it is needed the most.

DECONTAMINATION EQUIPMENT

Decontamination units use truck-mounted tank, pump, and water heater units and trailer-mounted pump and water heater units to conduct personnel and equipment decontamination operations. They also use standard water or fuel pumps with high-pressure nozzles.

Water is the most critical item and the major constraint in accomplishing decontamination operations. Pump units at decontamination sites use large amounts of water. For example, a pump used for personnel decontamination uses about 25

gallons of water per minute. A pump used for equipment or terrain decontamination uses about 50 gallons of water per minute. Therefore, NBC reconnaissance units try to select decontamination sites near plentiful water sources such as lakes, ponds, and dams. When large amounts of water are not available, decontamination unit leaders use collapsible water storage tanks to set up decontamination points. They resupply these points with tank trucks. Portable pumps are used to fill storage tanks and decontamination trucks quickly. In addition, these pumps are used to rinse decontaminants from equipment.

COMPLETE PERSONNEL DECONTAMINATION

As previously described, partial or emergency personnel decontamination is performed to reduce lethality of the contaminant until the situation allows for complete decontamination. During complete personnel decontamination operations, unit

commanders can give their soldiers rest. Protective clothing and masks can be removed. Soldiers can shower and get fresh protective clothing. If the tactical situation permits, they may even have time to rest before they put on their protective gear.

**THE PDS IS LOCATED IN A
SECURE, CONCEALED AREA**

Personnel Decontamination Station

Complete personnel decontamination is conducted at a personnel decontamination station (PDS). The PDS is set up in a secure, concealed area, located as far forward as the tactical situation permits. It should also be near a medical aid station. Personnel from both the decontamination unit and the supported unit operate the PDS. The decontamination unit leader works with the supported unit commander to get needed support.

The supported unit may be asked to—

- Prepare PDS sites.
- Supervise personal gear decontamination.
- Transport personal effects to a clean assembly area.
- Control entry and exit from the PDS.
- Supply the items that the decontamination unit does not have.
- Furnish all regular replacement clothing.

Each PDS, operated by one decontamination squad (NBC defense company) or one decontamination team (decontamination detachment), can—

- Exchange 300 sets of NBC protective clothing.
- Supply 300 bath towels.
- Supply 480 bars of soap.

Requirements that exceed these capabilities must be satisfied by using field expedients or by obtaining additional support. The items needed to run the PDS are listed in appendix B. The decontamination unit leader organizes the PDS as shown.

**THE DECONTAMINATION
UNIT LEADER ORGANIZES
THE PDS AS SHOWN**

PERSONNEL DECONTAMINATION STATION

A One decontamination specialist controls flow of personnel into the station.

B One decontamination specialist supervises decontamination of individual gear.

C Two soldiers from the supported unit assemble individual gear, personal items, and decontaminated boots. They then carry these items to the clean area, close to the station exit. Soldiers pick up their gear at this point when leaving the station.

D One soldier from the supported unit works on the decontamination line. He collects personal items from soldiers as they undress, places them in individual bags, and gives them to the loader-transporter soldiers.

E One decontamination specialist supervises the undressing line. He briefs contaminated soldiers on proper undressing procedures. He also cuts the backs of their undershirts so they can pull them forward over their arms. This

eliminates the need of unmasking to remove the shirt over the head.

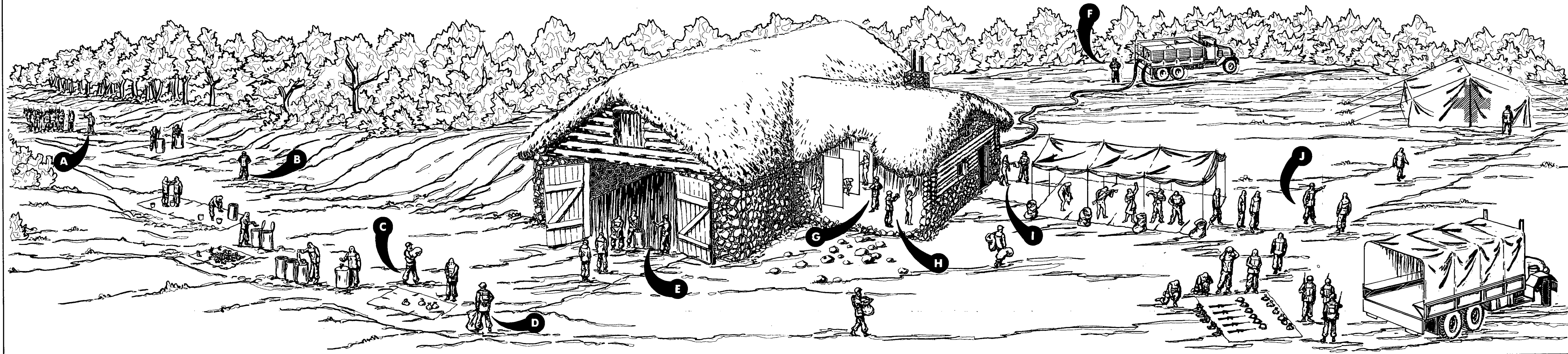
F One decontamination specialist operates either the truck-mounted or trailer-mounted decontamination apparatus which is connected to a shower rail. Water is pumped directly from a collapsible tank or a natural water source. When it is impossible to locate the PDS close to a natural water source, high capacity pumps are used to fill collapsible tanks which, in turn, supply water to decontamination equipment.

G One decontamination specialist supervises the shower stage. He briefs contaminated soldiers on proper procedures for rinsing the mask and hood, and for decontaminating their bodies.

H One decontamination specialist monitors soldiers that exit the shower for radiation. He also inspects them and their masks for cleanliness.

I The decontamination NCO works with an NCO from the supported unit. They give towels and clothing to soldiers as they leave the shower. They also direct soldiers to the aid station or to the clean assembly area.

J The decontamination squad leader supervises personnel decontamination station operations.



Personnel Decontamination Procedures

Detailed procedures are followed to insure that all contamination is neutralized or removed from each soldier, his personal equipment, and his outer clothing. *Specific tasks must be completed at specific times, so contaminants from exposed clothing and gear do not contact the skin of undressing soldiers.* More information on undressing and showering procedures can be found in TM 3-220.

Soldiers are extremely vulnerable to enemy fires during complete personnel decontamination operations. Therefore, camouflage, concealment, and operational security are essential. Smoke is frequently used to conceal complete personnel decontamination operations. Automatic chemical agent alarm systems are also placed upwind of the station to warn of chemical attacks.

**CAMOUFLAGE, CONCEALMENT,
AND SECURITY ARE CRITICAL
DURING DECONTAMINATION
OPERATIONS**

**STEPS FOR CONDUCTING
COMPLETE PERSONNEL
DECONTAMINATION
OPERATIONS ARE
DESCRIBED AS SHOWN**

The PDS line can handle two soldiers at the same time. It takes about 30 minutes for a soldier to complete the entire operation. However, normal field conditions cannot sustain this rate indefinitely. Soldiers working at the station need rest while wearing full protective clothing. Water and clothing resupply problems may slow the maximum decontamination rate. In addition, mechanical breakdowns in decontamination equipment may stop the operation completely. Therefore, decontamination unit leaders must coordinate with supported unit commanders to determine—

- Realistic personnel decontamination rates.
- Potential problem areas.
- Maintenance requirements.

THESE ACTIONS OCCUR AT EACH NUMBERED STEP OF THE PERSONNEL DECONTAMINATION STATION

STEP 1 Contaminated soldiers enter the station from the downwind end and decontaminate their combat gear (weapon, pack, harness, and web gear) by submerging it in buckets of slurry mixture. Slurry is prepared by the decontamination unit. One decontamination specialist supervises this point. Once gear is decontaminated and rinsed in water, clean soldiers from the contaminated unit move it to the assembly area at the opposite end of the PDS.

STEP 2 Two soldiers move into a small pit containing a solution that decontaminates any chemical hazards on their protective overboots. They wash gross contaminants from each other's mask and hood using hot, soapy water. The hot, soapy water is supplied by the decontamination unit. They then wash their protective gloves in hot, soapy water and move to the next station.

STEP 3 Soldiers remove their overboots and discard them. They then

decontaminate their combat boots by thoroughly scrubbing them twice with hot, soapy water and then rinsing them in clean water. The decontamination unit furnishes water and brushes.

STEP 4 Soldiers remove their combat boots and hand them to members of the supported unit who transport the boots, along with personal items and combat gear (steps 1 and 7), to the clean assembly area.

STEP 5 Soldiers remove protective overgarments and place them in a container furnished by the decontamination unit.

STEP 5 Soldiers remove gloves and place them in a container.

STEP 7 Soldiers are given personal effects bags in which they place their wristwatches, wallets, or rings. Personal effects bags are furnished by the decontamination unit. Bags are identified by the soldiers' dog tags. This

step is supervised by one soldier from the supported unit. The supported unit also transports effects bags to the clean assembly area.

STEP 8 Soldiers remove fatigue shirts and trousers and place them in a container. This step is omitted in hot weather when fatigues are not worn.

STEP 9 Soldiers remove underwear and socks and place them in a container. The undressing supervisor helps soldiers by cutting the backs of their undershirts.

STEP 10 Soldiers enter the shower, still wearing their masks and hoods. The soldiers rinse their masks and hoods by placing their heads in the shower. They hold their hands over the mask inlet valves so water does not damage the filter elements. The soldiers then leave the shower and go to the holding area. There, they take a deep breath and remove their masks and hoods. Then, they return to the shower quickly and wash their bodies with soap. After showering, they return to the holding area to pick up their masks and hoods.

STEP 11 For nuclear contamination, soldiers are monitored after their shower. If still contaminated, they shower again and are remonitored. This cycle is repeated until contamination is reduced to an acceptable level. A soldier from the decontamination unit supervises this step.

STEP 12 After drying, the soldiers enter the clothing exchange and dressing point. Here, they receive underwear and NBC protective clothing. The decontamination

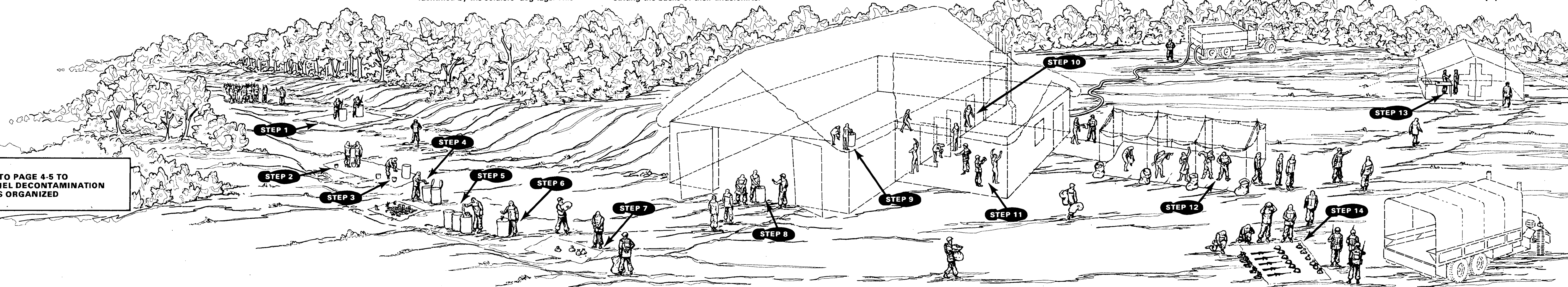
unit and the contaminated unit work together to supply both protective and regular clothing. Fatigues are issued in cool climates. In addition, replacement filter elements for the masks are issued if needed. The filter elements are supplied from the supported unit's prescribed load.

STEP 13 Soldiers needing medical treatment go to the medical treatment facility (MTF) or triage point. Patients needing emergency medical aid prior to

decontamination are cared for as described in FM 8-9. Patients who cannot decontaminate themselves are assisted by others in the unit. The MTF commander or his representative works with the decontamination unit. They organize the decontamination station so that it can accommodate casualties.

STEP 14 After leaving the MTF or the clothing exchange and dressing point, soldiers move to an assembly area and retrieve their personal effects bags, boots, and individual equipment.

TURN BACK TO PAGE 4-5 TO
SEE HOW A PERSONNEL DECONTAMINATION
STATION IS ORGANIZED



Decontamination unit personnel who are working on the undressing line must be fully protected against contamination. *Full NBC protective equipment is needed when handling troops with gross chemical contamination or suspected biological contamination.* Gloves and aprons are enough when handling personnel with radiological contamination.

If male and female troops are grossly contaminated with a chemical agent, both are decontaminated without regard to gender. However, if there is no emergency, women are decontaminated separately from men. Women from the supported unit are used to support the operation if possible.

Water runoff from any decontamination operation is collected in a sump. If the sump overflows, water should be channeled away from the water source. This lets contaminated water filter naturally before it returns to the water source. Runoff from any

decontamination operation is considered contaminated. It must be marked with an appropriate NBC contamination marker: chemical, biological, or atomic. Engineer support is normally needed to prepare the sump.

When the decontamination operation is completed, unusable contaminated overgarments and unserviceable undershirts are buried. Containers from the undressing line are emptied into a pit by personnel from the decontamination unit. Super tropical bleach (STB) is spread over the garments. The pit is then covered with dirt and marked with appropriate NBC contamination markers by decontamination personnel. Usable garments are sealed in bags and taken to a corps-level laundry facility equipped to deal with NBC contaminated clothing. Bags must be clearly marked as containing hazardous material. This backhaul operation is coordinated through combat service support channels.

PARTIAL EQUIPMENT DECONTAMINATION

As previously described, partial decontamination is conducted by both contaminated units and decontamination units. Partial decontamination destroys, neutralizes, or removes most of the NBC hazards from personal gear and unit equipment. It can be done quickly. It also extends the time that personnel can wear their contaminated clothing without processing through a personnel decontamination station. In addition, it substantially decreases the amount of time it takes for natural weathering or aging to reduce an NBC hazard on personal and unit equipment to a safe level.

Contaminated units conduct partial decontamination operations as described in FM 21-40. Decontamination units help other units partially decontaminate vehicles and other large items of equipment since they are equipped to do a faster and better job. Decontamination units conduct partial equipment decontamination operations by quickly washing contaminated equipment with hot, soapy water. These operations are done at a hasty decontamination site that is

selected by NBC reconnaissance units as described in chapter 3.

Battalion and brigade chemical officers coordinate with operations officers to obtain the needed decontamination support. Commanders determine the need for partial decontamination. They also determine the effect of decontamination on current and future operations and risks associated when partial decontamination is not done. There is no check to see if the contaminants are completely removed. Moreover, NBC protection is still needed after decontamination. The purpose of partial equipment decontamination is to—

- Limit the spread of contamination on the battlefield.
- Minimize the hazard.
- Make complete decontamination easier and quicker.

Partial decontamination normally reduces radiological and biological contamination to acceptable levels. However, *persistent chemicals cannot be completely removed or*

neutralized through this process. Persistent chemicals penetrate grease, dirt, rubber, canvas, and painted surfaces. The quicker these agents are washed away, the easier it is to completely remove them as discussed later in this chapter. Hot, soapy water is best suited for use as a partial decontaminant. The hotter the water, the better the decontamination process. Hot, soapy water helps to remove persistent chemicals before they are absorbed deep into porous materials. To be effective, partial decontamination of chemical contaminants should begin within 1 hour after contamination.

Partial equipment decontamination is conducted as far forward as possible. Decontamination units quickly wash contaminated equipment with hot, soapy water. Normally, 1 or 2 minutes are spent on each item. To speed up the operation, contaminated vehicles are driven between two or more decontamination apparatuses, so both sides can be decontaminated at the same time. The equipment is not checked for contamination after the operation is complete. However, onboard radiacmeters are used to measure radiological contamination quickly.

**AN EXAMPLE OF A
PARTIAL EQUIPMENT
DECONTAMINATION
OPERATION IS SHOWN**

SEE THE FOLLOWING PAGE
FOR COMPLETE
EQUIPMENT DECONTAMINATION

A brigade is defending with three battalions abreast. During the covering force battle, the enemy uses a persistent nerve agent to protect his flanks as he launches a main attack in the center sector. The battalion in the center (A) effectively delays the enemy's advance. However, one tank platoon on the right flank is grossly contaminated by the chemical attack.

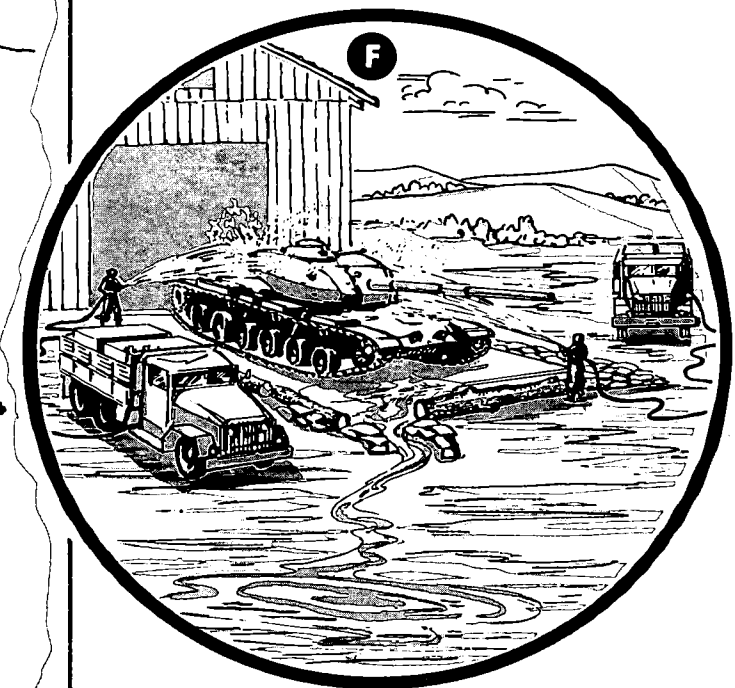
The NBC defense platoon, **B** in direct support of the brigade, is given the decontamination mission. The brigade

chemical officer and the NBC defense platoon leader locate a small farm **C** to the rear of battle position A14. Two three-men reconnaissance teams **D** move to battle position A14 to locate a hasty decontamination site. One decontamination squad **E** moves to battle position A14 to conduct partial decontamination operations.

The NBC reconnaissance team directs contaminated tanks into the decontamination point. The decontamination squad sets up its truck, land trailer-mounted, power-driven decontamina-

tion apparatuses: one on each side of a concrete hardstand located near a barn **F**. Contaminated tanks are driven between the apparatuses as each unit washes one side of the tank with hot, soapy water.

Chemical contamination washed from the tanks is decontaminated by dry STB. Runoff is channeled by logs and sandbags into low areas treated with STB. The decontamination squad does not check the tanks for contamination because speed is important. The entire operation takes only a few minutes.



COMPLETE EQUIPMENT DECONTAMINATION

Complete equipment decontamination lowers the amount of chemical contamination to a level in which soldiers can operate equipment without protective clothing and masks. Complete equipment decontamination is done at an equipment decontamination station (EDS). The EDS is established as far forward as possible. Both the decontamination unit and the contaminated unit work together to perform the operation. Uncontaminated crews operate the clean equipment.

Complete equipment decontamination may be done in rear areas to decontaminate combat replacement equipment before it is moved forward. It may also be done in forward areas when equipment has been contaminated with chemicals and the crews are clean. When both crews and equipment are contaminated, combined complete personnel and equipment decontamination operations are normally scheduled as described later in this chapter. In any event, complete decontamination operations take time. Therefore, they are only scheduled as the situation and mission permit.

THE DECONTAMINATION UNIT LEADER SETS UP A TYPICAL EQUIPMENT DECONTAMINATION STATION AS SHOWN

SEE NEXT PAGE FOR COMPLETE DECONTAMINATION PERSONNEL REQUIREMENTS

STEP 1 Equipment crosses the hotline, enters the station (downwind), and passes through a shallow pit filled with a decontamination solution. The solution decontaminates the undercarriage and running gears. Rocks or logs are added to the pit to give the vehicles traction. The supported unit prepares the pit, and the decontamination unit adds water and decontaminants to produce the solution.

STEP 2 Equipment moves to a hot, soapy-water wash to remove grease, dirt, gross

contamination, and the decontaminant. The decontamination unit works at this point, using a power-driven decontamination apparatus.

STEP 3 Supported unit soldiers apply DS2 to equipment for CB contamination. Scrubbing may be necessary to remove a thickened agent. This also improves the effectiveness of the DS2.

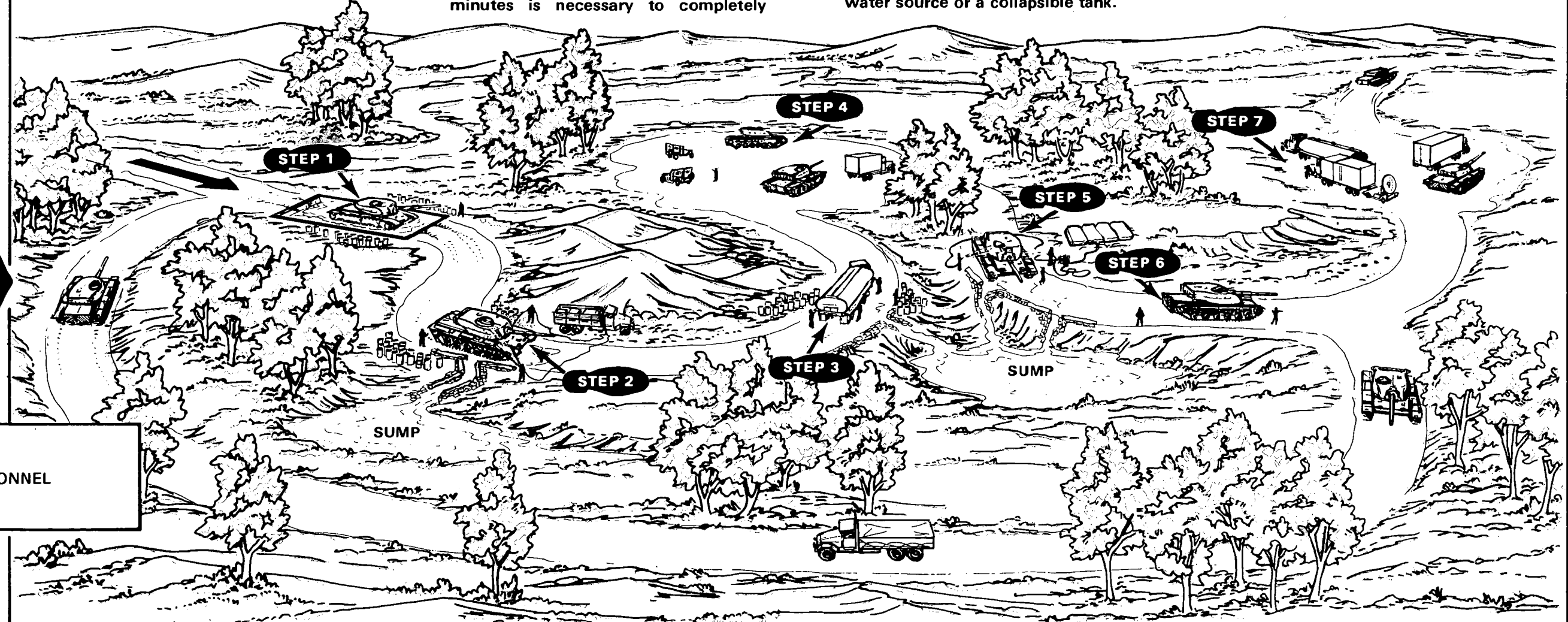
STEP 4 The equipment stays in a holding area to let the DS2 work. A full 30 minutes is necessary to completely

decontaminate mustard agent. For all other chemical agents, 20 minutes is sufficient. The supported unit is responsible for traffic control at the holding area.

STEP 5 Decontamination unit soldiers rinse DS2 (soap for radiological contamination) from the vehicles, using clean water pumped through high-pressure hoses. To do this, they use trailer-mounted pump and water heater units. Water is pumped from a natural water source or a collapsible tank.

STEP 6 Decontamination unit soldiers check vehicles for contamination. They use chemical agent detector kits for chemical contamination and radiacmeters for radiological contamination. Vehicles that exceed specified decontamination standards are recycled.

STEP 7 The supported unit dries and oils the equipment. This is necessary to prevent rust, since DS2 softens and removes paint.



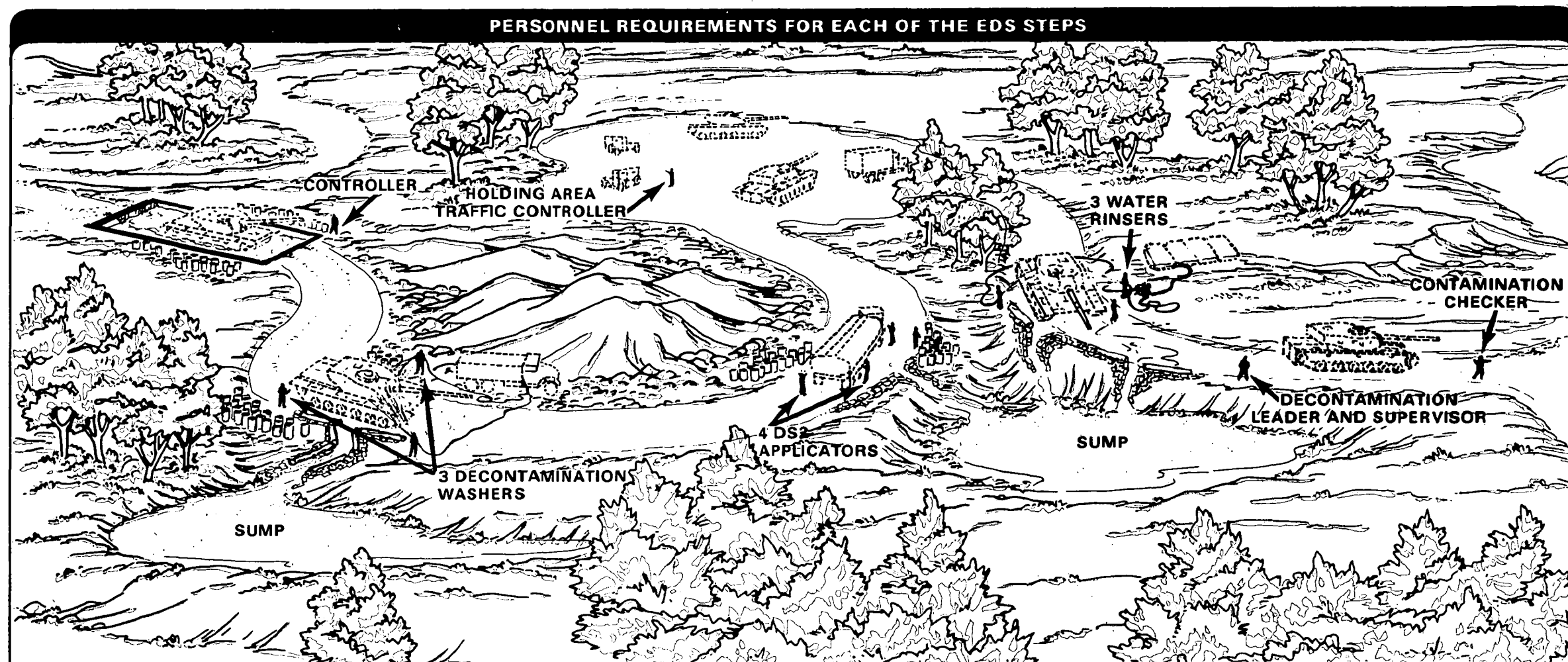
EDS Personnel Requirements

Items required to operate an EDS for both decontamination and supported units are listed in appendix C. Personnel requirements for each of the EDS steps previously discussed are shown below. Specific procedures performed by each soldier are discussed in TM 3-220.

One way for the contaminated unit to obtain EDS workers is to dismount uncontaminated crew members from their contaminated equipment at step 2 and have them follow the equipment through step 5 by walking on uncontaminated paths. These workers must be careful not to contaminate their clothing and boots while performing

decontamination tasks. Decontamination specialists act as working supervisors. Boots are decontaminated with hot, soapy water before clean vehicles are mounted at step 6.

Another way to obtain EDS workers is for the unit to let contaminated soldiers perform decontamination tasks. This insures that clean crews of contaminated vehicles stay clean. However, it also places a heavier demand on the unit's personnel resources. With this method, *decontamination operations usually slow down because personnel need longer rest periods as the operation progresses.*



The following example illustrates a complete decontamination operation.

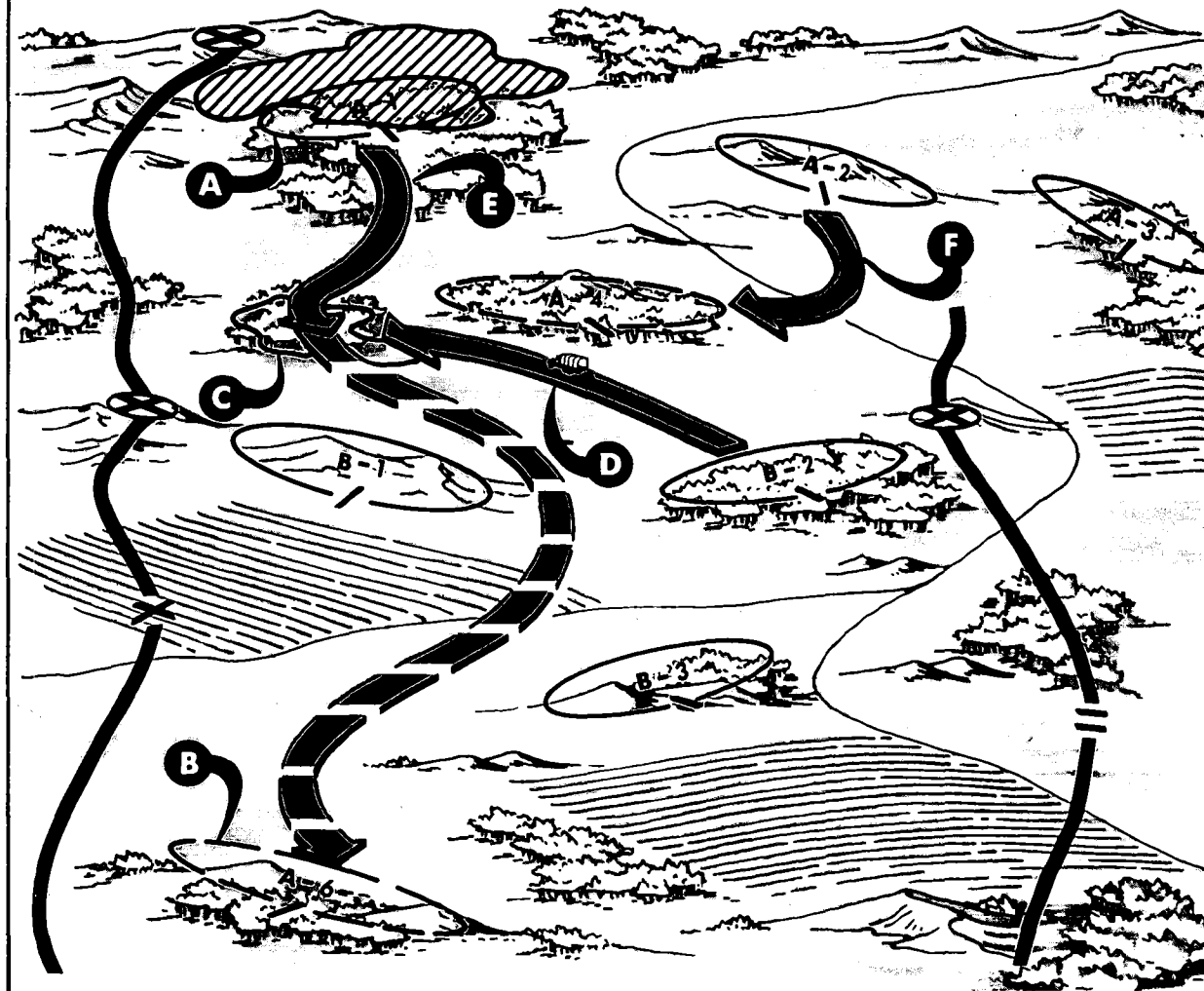
FOLD THIS OUT FOR
EDS PERSONNEL REQUIREMENTS

A COMPLETE EQUIPMENT DECONTAMINATION OPERATION

While conducting covering force operations, the equipment of an armored cavalry troop **A** is contaminated by a persistent nerve agent. The troop is to occupy a blocking position **B** behind the brigade rear boundary after completing the covering force mission. Due to the intensity of the battle, partial decontamination is not possible. A field decontamination site **C** is located by an NBC reconnaissance unit. One decontamination squad **D** moves from battle position B-2 to the field decontamina-

tion site to conduct equipment decontamination operations.

The cavalry troop moves to the decontamination area in prearranged order **E**. Vehicles most heavily contaminated lead the column. Other units **F** cover the area vacated by the contaminated troop. After reaching the decontamination area, troop vehicles are rotated through the decontamination point, following EDS procedures.



Complete Equipment Decontamination Capabilities

Each decontamination unit (squad or team) can operate one equipment decontamination station with help from the supported unit. The supported unit may be asked to—

- Prepare EDS sites.
- Apply DS2 to contaminated equipment.
- Control the entry and exit of equipment from the EDS.
- Dry and oil decontaminated vehicles and equipment.
- Provide security for the EDS.

The table below shows how long it takes to completely decontaminate a vehicle exposed to a chemical agent. The first vehicle through the line takes about 1 hour. After that, a vehicle is decontaminated every 15 minutes, using assembly line procedures. For biological contamination, chlorine compounds are added to the hot, soapy water. This insures destruction of all sporeforming biological agents. Since radiological contaminants cannot be destroyed or neutralized, they are washed from vehicles and covered with fresh earth to reduce radiation hazards.

TIME SPAN FOR DECONTAMINATION OF VEHICLE EXPOSED TO A CHEMICAL AGENT

1*	DECONTAMINATION PIT	1
2	WASH	5
3*	APPLY DS2	15
4*	DS2 CONTACT TIME	20 TO 30
5	RINSE	2
6	CHECK	15
7*	DRY AND OIL	10

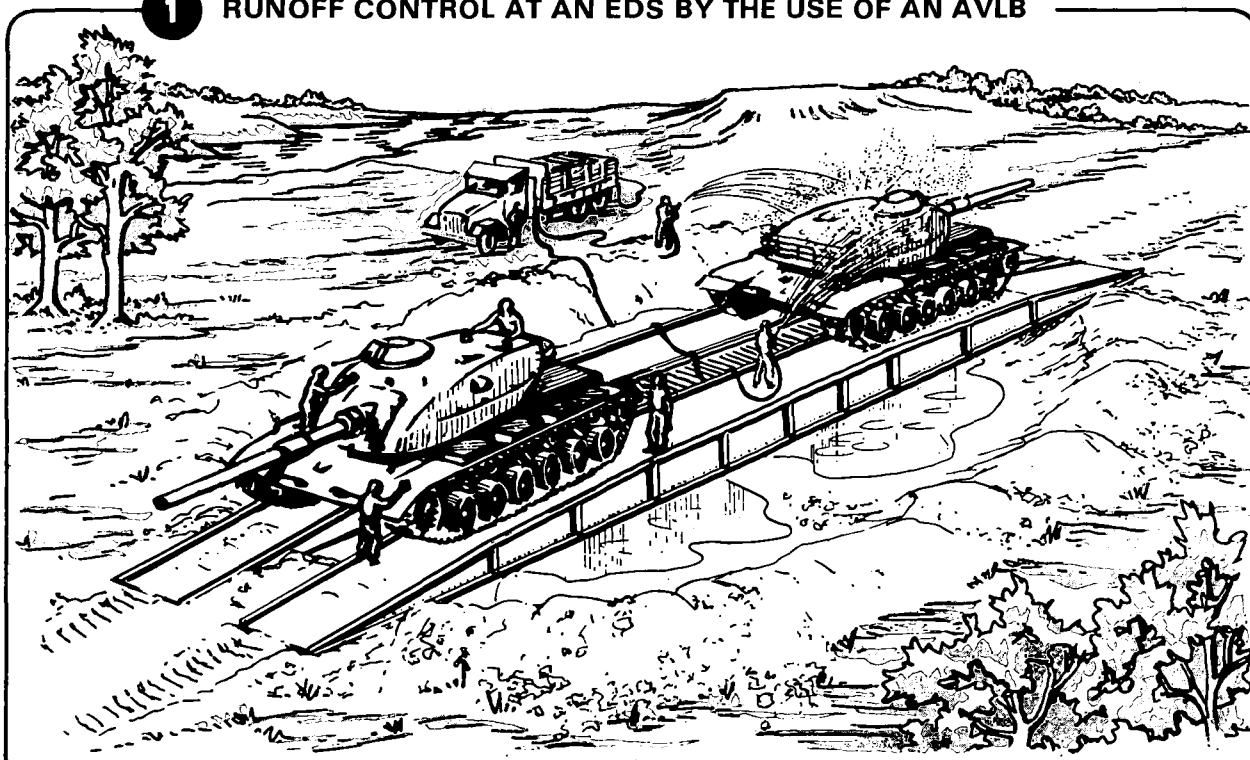
*These steps are omitted for biological and radiological decontamination operations. Also, step 7 is omitted if rust is not an immediate concern for chemical decontamination operations.

CONTROLLING CONTAMINATED RUNOFF AT AN EDS

Hundreds of gallons of water are used to decontaminate equipment. *Runoff must be controlled to prevent contamination of natural water sources and to keep equipment from getting stuck in mud holes.* There are many ways to control runoff. One way is to have engineers dig channels that direct the water into sumps. Decontamination specialists can then add STB to the sumps to decontaminate CB agents. Decontamination specialists can identify other procedures that make best use of the contaminated unit's equipment and of natural terrain features at the decontamination site. Here are three other ways to control runoff at an EDS.

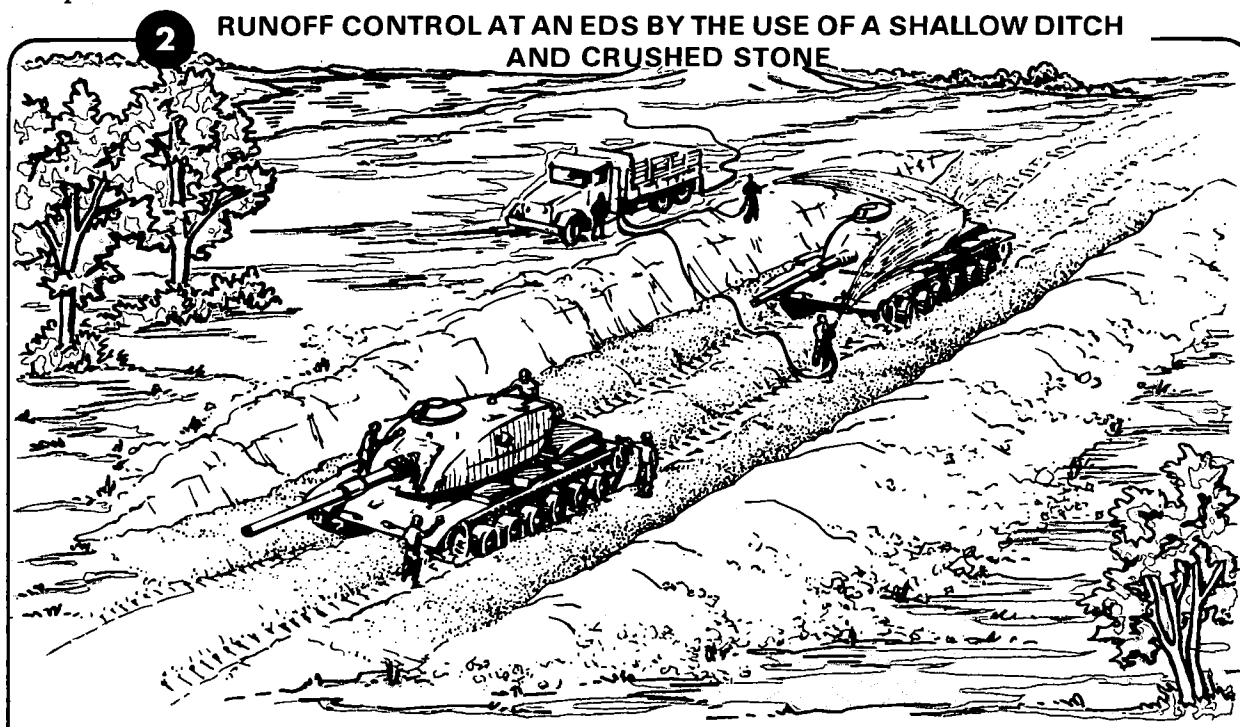
- 1 Engineer units dig a rectangular ditch. The contaminated unit lays an armored vehicle launched bridge (AVLB) across the ditch. Contaminated vehicles are washed at one end, while decontaminant is applied at the other as shown.

1 RUNOFF CONTROL AT AN EDS BY THE USE OF AN AVLB



2 Engineers dig a broad, shallow ditch and fill it with large, crushed stone. Ideally, the ditch should be gently sloped on rising ground to promote drainage. Engineers may be needed to supply crushed stone (1 1/2 inches to 3 inches in size). Contaminated vehicles are thus decontaminated, using procedures discussed earlier.

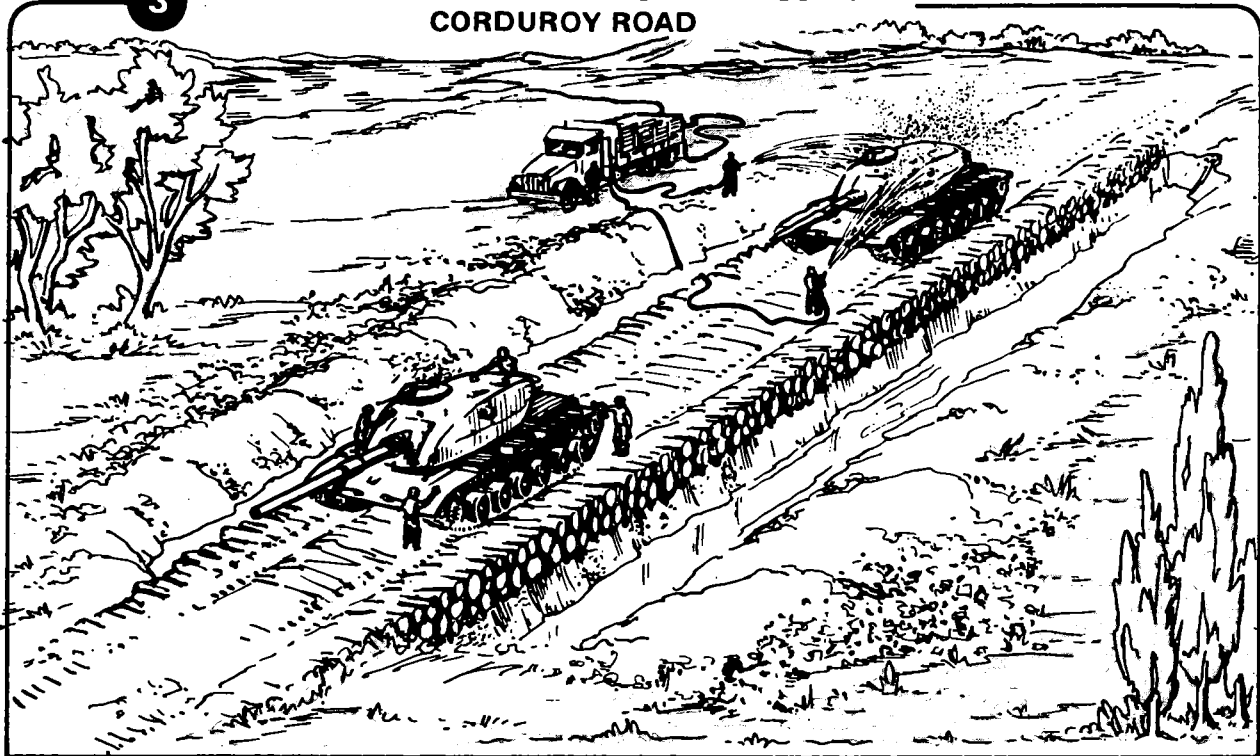
If the vehicles are contaminated with chemical or biological agents, the drip-drain area is covered with dry STB as explained earlier. The primary purpose of the crushed stone is to prevent creation of a large, muddy area. The stone absorbs the contaminated water and confines it to a small area where it can be treated with STB. Crushed stone may be obtained from local civilian sources and engineer rock-crusher units. It can also be found along railroad lines. Engineer units, equipped with front loaders, should be able to supply adequate crushed rock for a decontamination site. However, if support is not available, dry, rocky-stream beds are an acceptable substitute.



3 This technique uses a small section of corduroy road made of logs, heavy timber, or telephone poles. These items provide a stable surface for decontamination of tracked and wheeled vehicles without creating a large, muddy area. This technique also confines the contamination to a sump where it can be treated with STB. The length of corduroy

needed normally depends on the size of the decontamination operation and equipment available for construction. However, *a minimum of 50 feet is needed if the decontamination site is to accommodate the wash, scrub, and rinse stages of equipment decontamination.*

3 RUNOFF CONTROL AT AN EDS BY THE USE OF A CORDUROY ROAD



COMBINED PERSONNEL AND EQUIPMENT DECONTAMINATION OPERATIONS

Most often, soldiers and equipment need to be decontaminated at the same time. This concurrent decontamination produces a complete weapon system that can be operated by a crew who does not require full NBC protection. However, combined personnel and equipment decontamination requires a great deal of resources and time. Therefore, it cannot always be done. When time and resources are scarce, it is best to perform partial equipment decontamination and complete personnel decontamination.

Partial equipment decontamination immediately reduces hazards and, when time permits, makes complete equipment decontamination easier. Complete personnel decontamination gives soldiers a rest. It also gives them an opportunity to change clothing and satisfy personal needs before again donning protective clothing. These procedures greatly enhance individual and unit combat effectiveness even though equipment is still contaminated. However, combined personnel and equipment

decontamination is preferred when possible. These operations are conducted by establishing a combined personnel and equipment decontamination station.

Combined Personnel and Equipment Decontamination Station

Combined personnel and equipment decontamination operations are performed by collocating a personnel and an equipment decontamination station. Two decontamination squads or teams should be used: one for each station as previously described. However, a *one-squad operation may be the most frequently used on an active NBC battlefield, since there will most likely be many contaminated units.* The personnel and equipment needed by one squad or team to operate a combined station are shown in the illustration to the right. The jobs performed at each station are the same as those discussed earlier (pages 4-4 and 4-10) except that soldiers in the supported unit have additional jobs.

HERE IS ONE WAY TO CONDUCT A COMBINED PERSONNEL AND EQUIPMENT DECONTAMINATION OPERATION

Another way to conduct this operation is to keep the crew with the vehicle. The crew helps decontamination specialists wash equipment and apply decontaminants. Then, crew members, less the driver, move to the PDS. The driver helps rinse the vehicle before moving to the PDS. If a vehicle is recycled because of detectable contamination, another crew may be used to again decontaminate the vehicle.

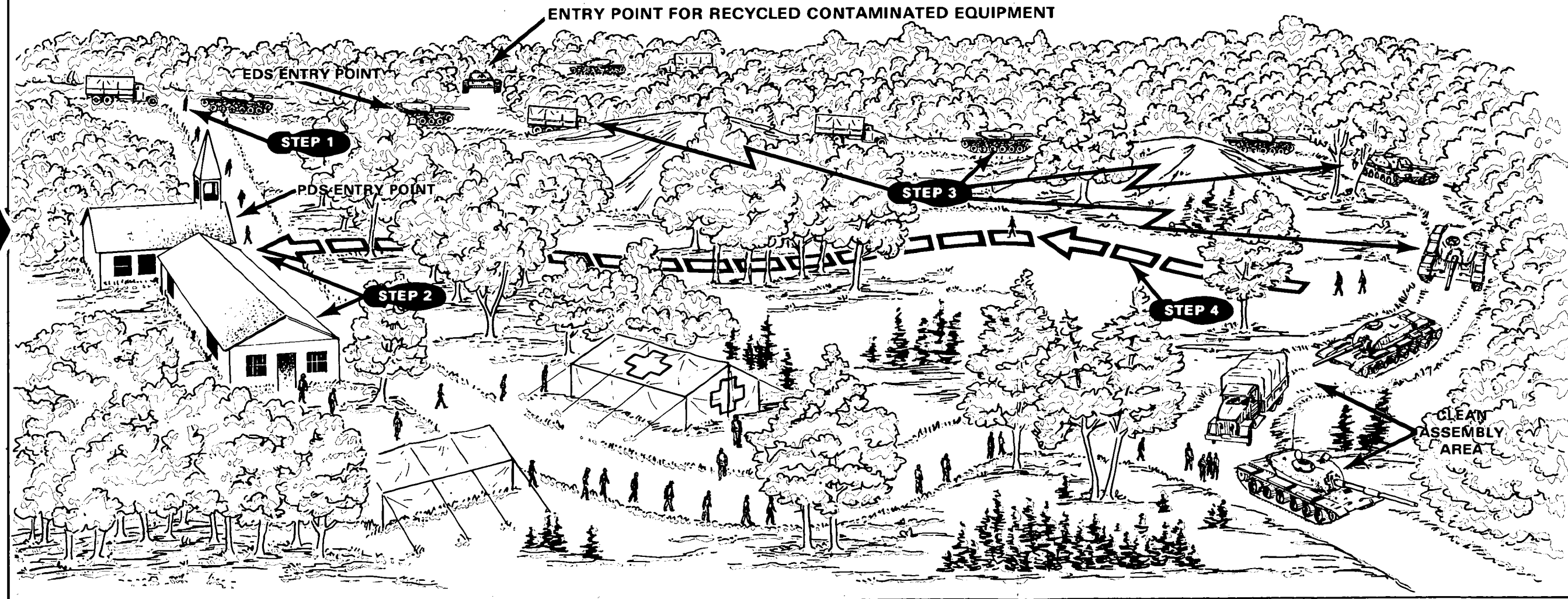
The decontamination and supported unit leaders decide on a specific procedure to use. The supported unit normally details soldiers to guide vehicles and crews through the

STEP 1 The supported unit commander directs contaminated vehicles and crews into a control separation point. Contaminated crew members dismount and walk to the PDS entry point. The driver remains with the equipment and drives the vehicle to the EDS entry point.

STEP 2 The decontamination unit and the supported unit follow the PDS procedures discussed on page 4-4. The only difference is that more soldiers from the supported unit are needed to operate the station.

STEP 3 The decontamination unit and the supported unit follow the EDS procedures discussed on page 4-10. However, since one decontamination unit (squad or team) is operating a combined station, the supported unit must perform additional duties.

STEP 4 After equipment passes the decontamination checkpoint, the driver, if contaminated, moves with the wind to the PDS. A crew member, who has been through the personnel decontamination station, takes the vehicle to the clean assembly area.



complete decontamination process. The supported unit may also be asked to—

- Prepare PDS and EDS sites.
- Wash vehicles.
- Apply DS2 to vehicles and equipment.
- Rinse vehicles and equipment.
- Supervise personal gear decontamination.
- Transport decontaminated personal gear to clean assembly areas.
- Supervise undressing procedures.
- Bag personal items.
- Supervise shower operations.
- Assist in clothing exchange.

Personnel and Equipment Decontamination Rates

Decontamination production rates for a combined personnel and equipment decontamination operation are the same as those for separate EDS and PDS operations. The EDS operation requires about 60 minutes for the first vehicle. After that, a vehicle is decontaminated every 15 minutes. The PDS operation requires about 30 minutes for the

first two soldiers. After that, two soldiers are decontaminated every 5 minutes. *To maintain these production rates, decontamination and supported unit workers need scheduled rest intervals or worker replacements.* The decontamination unit leader must coordinate these requirements.

TERRAIN DECONTAMINATION

NBC terrain decontamination costs so much in time, manpower, and materials that the operation should be avoided unless absolutely necessary. The decontamination unit prepares the STB slurry. They use 650 pounds of STB (in 50-pound drums) mixed with 225 gallons of water, 12.5 pounds of M2 antiset, and 24 ounces of antifoam

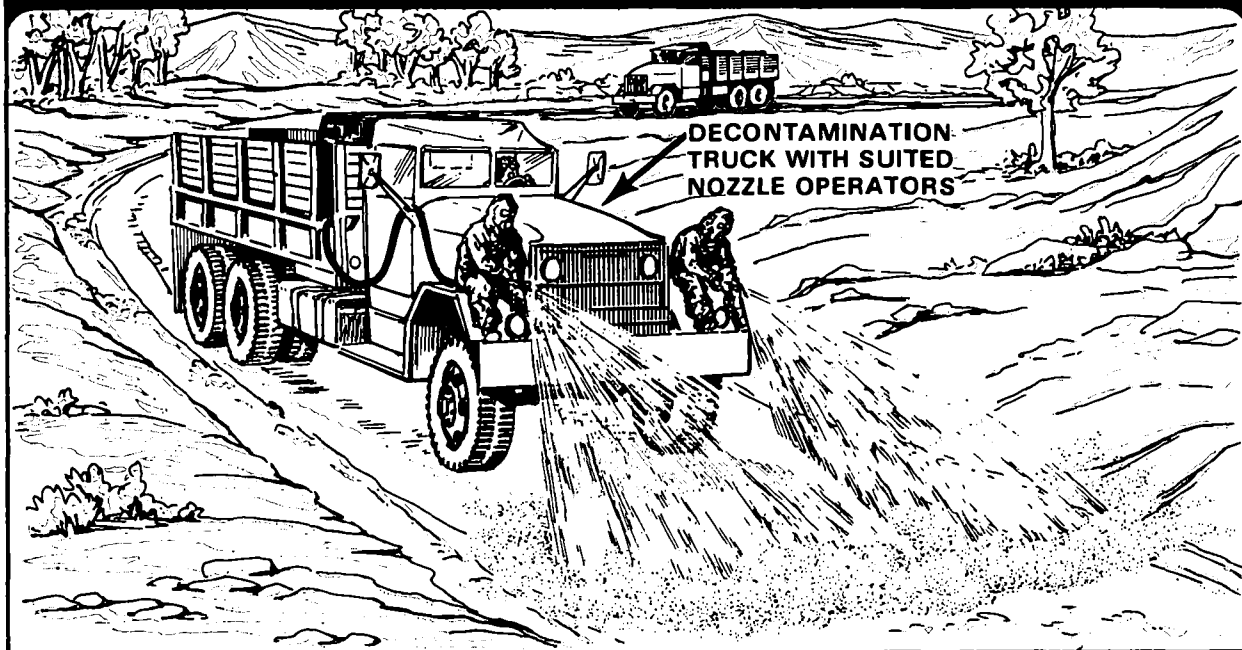
compound. This mixture results in an operational load of about 270 gallons of slurry. The required amount of STB is reduced to 650 pounds to delay the setting action of the STB when mixed with water. *The effectiveness of the slurry decreases when there is a drop in the STB.*

Terrain Decontamination Procedures

The best way to decontaminate terrain exposed to CB agents is to drive a decontamination truck through the area while operators spray slurry in front of the vehicle. The operators sit in the seats mounted on the front fenders of the 5-ton truck and use high-pressure spray nozzles as shown on the next page. For radiological contaminants, water may be used to wash con-

taminants from hard-surfaced roads. This procedure concentrates the contaminants on the shoulders of the road and requires that they be covered with dirt to reduce radiation exposure. However, it does insure complete coverage of the contaminated surface. Decontamination personnel must wear the necessary protective equipment.

TERRAIN DECONTAMINATION BY TRUCK



Terrain Decontamination Capabilities

The amounts of slurry needed to decontaminate CB agents vary with the type of terrain. Hard, nonporous materials (such as concrete roadways) need less slurry than gravel roads. Short, grassy areas need less

slurry than areas with long grass and brush. The following table shows how much terrain can be decontaminated using slurry on various surfaces.

AMOUNTS OF SLURRY NEEDED FOR TERRAIN DECONTAMINATION ON VARIOUS SURFACES

TYPE OF SURFACE	PER GALLON	COVERAGE PER LOAD
CONCRETE ROADWAY (SMOOTH)	3.7M ² *	993M ²
MACADAM OR GRAVEL ROADWAY (LOOSELY SURFACED)	1.8M ²	497M ²
SHORT GRASS (3 TO 5 INCHES)	1.2M ²	339M ²
LONG GRASS OR LOW BRUSH	0.84M ²	226M ²
*M ² = SQUARE METERS		

Terrain decontamination is extremely costly. Decontamination of a 10-meter wide concrete roadway, for example, requires one

decontamination truckload of slurry for each 100 meters of road. Time required to load, mix, and spray the slurry is 1 hour.



CHAPTER 5

Combat and Combat Service Support

INTRODUCTION

As described in chapter 2, nuclear, biological, and chemical (NBC) defense companies, elements, and detachments often require some combat support and combat service support from other units.

SUPPORT OF THE NBC DEFENSE COMPANY

Divisional and corps support command NBC defense companies can provide some administrative, maintenance, supply, and transportation services to their platoons. In order to reconnoiter and decontaminate, it is necessary to give additional support to reconnaissance and decontamination platoons. One way to obtain this support is to attach NBC reconnaissance and decontamination platoons to supported units. An NBC

unit, placed in an organization on a temporary basis, is attached. *Subject to the limitations of the attachment order, the unit commander, receiving the attached NBC unit, has the same control of the attached unit as he does over units organic to his command.* Most often, attachment of platoons is necessary because distance, time, and limited capabilities rule out effective support and control by the NBC defense company commander.

When NBC platoons receive most of their support from their attached unit, the divisional company headquarters gets the support they need from the division headquarters and headquarters company. Normally, the divisional NBC defense company is collocated with the division headquarters and headquarters company in the area of the division's main command post (CP). In the same manner, the corps support command (COSCOM) NBC defense company normally collocates with the COSCOM headquarters and headquarters company to get needed support.

However, it may sometimes be practical to place the entire company in direct support of a unit. At other times, just the platoons may be needed. In either case, *the company or its platoons must respond to requirements of the supported unit.* The company headquarters is responsible for getting support for its platoons. Here also, the divisional company headquarters section generally locates near

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Maintenance	5-2
Supply and Transportation Support	5-3
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Fire Support	5-4
Engineer Support	5-5
SUPPORT OF SEPARATE RECONNAISSANCE AND DECONTAMINATION DETACHMENTS	5-5
SUPPORT OF NBC ELEMENT DETACHMENTS	5-6

the division headquarters to get support. For the same reason, the COSCOM NBC company headquarters locates near COSCOM headquarters as in the case of attachment. Another way to provide for support is to direct the nearest unit to help the NBC company. This can be done with a mission-type order or by attaching the NBC company or its platoons to such a unit for specific categories of support.

Administration and Food Service Support

Whenever possible, the NBC defense company provides administrative and food service support to its platoons. When platoons are attached to other units, administrative (less responsibility for transfer and promotion) and food service support comes from the supported unit. Whenever possible, cooks and administrative personnel should accompany the attached platoon to lessen the burden on the supported unit.

If a platoon is placed in direct support of a unit, food service arrangements for the platoon should be made with the supported unit. Here also, NBC defense company cooks generally accompany the platoon to the supported unit. In the case of the COSCOM NBC defense company, it is best to consolidate personnel and food service functions with the COSCOM headquarters and headquarters company.

Maintenance

NBC defense companies have some organizational maintenance capabilities. The maintenance of decontamination equipment presents a special problem, since mechanics with special skills are needed to work on the equipment. Normally, there are not enough mechanics in NBC defense units. Thus, it may be necessary for NBC defense unit mechanics to work with supported unit mechanics during repair operations. Maintenance for vehicles and other common equipment can be coordinated with the division support command (DISCOM)

**MECHANICS WITH SPECIAL SKILLS
ARE NEEDED TO REPAIR
DECONTAMINATION EQUIPMENT**

forward area support coordinator (FASCO), who operates in the brigade support area. It may sometimes be necessary to request direct support maintenance contact teams to perform both backup organizational and direct support maintenance on decontamination equipment. However, mechanics, skilled in other equipment repair, should be cross trained to work on decontamination equipment. Because of low density of reconnaissance and decontamination equipment, provisions should be made for early recovery and evacuation of damaged items. The reconnaissance or decontamination unit leader coordinates with the supported unit during recovery and evacuation operations.

Supply and Transportation Support

NBC defense companies supply a limited number of protective clothing sets, soaps, towels, and decontaminants to support decontamination operations as described in chapter 4. These prescribed load items give support until resupply is accomplished. NBC defense companies cannot physically carry everything they need to conduct sustained decontamination operations. The decontamination unit, contaminated unit, and supporting supply and transportation units must work together to get the right items, in the correct number, to the proper place, at the right time. Thus, all units should plan for resupply of protective equipment, regular clothing, individual combat gear, decontamination kits, and chemical antidotes. This should be done prior to conducting complete personnel decontamination. NBC defense company leaders, staff chemical officers, and logistics staff officers plan for distribution of decontaminants. Since decontamination units have a limited number of trucks and personnel, supply point distribution procedures usually do not work. Decontamination operations must be done quickly. Supply and transportation units normally deliver replacement protective gear and decontaminants directly to the decontamination station. If necessary, transportation priorities may have to be adjusted to support complete personnel

**NBC DEFENSE COMPANIES
MUST RELY ON SUPPLY AND
TRANSPORTATION UNITS FOR THE
RESUPPLY OF DECONTAMINATION
ITEMS**

decontamination of units that can no longer operate in contaminated NBC protective gear.

Medical Support

Medical support is obtained from supported units, usually a brigade or regiment. NBC reconnaissance teams, operating with tanks or infantry battalion scouts or cavalry units, get support from the supported headquarters.

Decontamination teams, conducting partial equipment decontamination operations, should coordinate medical support with the contaminated unit. Normally, personnel and equipment decontamination stations are set up near medical aid stations. In such cases, decontamination teams get medical support from the nearby station. If medical facilities are not available, the decontamination unit leader coordinates medical support with the contaminated unit.

Fire Support

As previously described in chapter 3, NBC reconnaissance squads are not equipped to fight to gain information. Once contact is made with enemy forces, the situation is rapidly developed to insure their survivability. Artillery or mortar fires may be necessary. Therefore, fire support procedures are set up prior to operations.

When NBC reconnaissance units operate with tank, infantry, or cavalry scouts, all units use the same fire support request channels. However, when they operate independently, different procedures are used. Normally, one artillery battalion is designated to receive calls for fire. Since one NBC defense platoon usually supports each brigade, the brigade's direct support battalion answers the platoon's calls for fire. *If additional fire support is necessary, fire support requests may flow from the reconnaissance squad through the artillery battalion fire support officer to the brigade fire support officer.* Requests may even be sent to the division fire support element for tactical air support. In any event, normal fire support channels are used wherever possible.

FIRE SUPPORT PROCEDURES ARE PLANNED PRIOR TO RECONNAISSANCE OPERATIONS

Engineer Support

NBC reconnaissance teams locate decontamination sites as described in chapter 3. To completely decontaminate equipment and personnel, decontamination sites must be prepared to control contaminated runoff as described in chapter 4. Engineer support is normally required because large sumps may have to be dug. In addition, movement lanes between various points at the equipment decontamination station may need to be cleared. The NBC reconnaissance leader, who selects the site, coordinates these requirements with engineer units ordered to provide support. On arrival at the site, the decontamination unit leader completes the coordination of site support requirements. Equipment from the decontamination unit, contaminated unit, and engineer unit is needed to accomplish the job. *All must work together.*

Most often, NBC defense companies need backhoe, bulldozer, and demolition support. Armored vehicle launched bridges (AVLB) are frequently needed for equipment decontamination operations to keep vehicles from getting bogged down in mud.

Elaborate site preparations are avoided, since decontamination operations must be finished quickly. In addition, decontamination units move frequently to support operations and to increase survivability. Thus, reconnaissance and decontamination unit leaders try to cut down on engineer support and increase the use of natural terrain features. Brigade and COSCOM area support group chemical staff officers coordinate support requirements with the engineers and NBC defense platoon leaders.

SUPPORT OF SEPARATE RECONNAISSANCE AND DECONTAMINATION DETACHMENTS

One reconnaissance detachment and one decontamination detachment are generally assigned to each separate brigade and armored cavalry regiment. Other separate detachments may be assigned to corps and major support units. They are usually organized so that the senior detachment commander controls both units.

Separate detachments have no administrative or logistical support capabilities. Therefore, they are attached to other units for these services. Command control is normally maintained at brigade or regimental headquarters.

The decision to place separate reconnaissance and decontamination detachments with a unit depends on the following considerations: the unit's current support load, billeting capacity, maintenance facilities, and geographical location. But, *the most important consideration is to let*

separate detachments train as they fight. Since centralized control and decentralized operations are normal, the brigade or regimental headquarters and headquarters company are usually the best choices. Separate detachments should train together for a period of time to practice troop leading procedures and the reconnaissance and decontamination operations described in chapters 2, 3, and 4. Later, they may be placed in direct support of or possibly attached to battalion task forces or squadrons.

NBC reconnaissance and decontamination detachments need the same fire support and engineer support as NBC defense companies. Normally, administrative support is easier since detachments are small. However, supply, transportation, maintenance, and medical support requirements are similar to those of NBC defense companies. Procedures for obtaining support are the same as those previously described for NBC defense companies.

SUPPORT OF NBC ELEMENT DETACHMENTS

As described in chapter 2, NBC elements do not have many soldiers or major items of equipment. Therefore, service support requirements are satisfied easily. Since detachments augment NBC elements found

in the division, COSCOM, or corps headquarters, it is best to attach them to the supported units headquarters and headquarters company for administrative and logistical support.

APPENDIX A

References

PUBLICATION NUMBER	TITLE
ARMY REGULATIONS (AR)	
AR 220-58	<i>Organization and Training for Nuclear, Biological, and Chemical Defense</i>
AR 310-25	<i>Dictionary of United States Army Terms</i>
AR 310-34	<i>Equipment Authorization Policies and Criteria, and Common Table of Allowance</i>
AR 310-50	<i>Authorized Abbreviations and Brevity Codes</i>
FIELD MANUALS (FM)	
FM 3-8	<i>Chemical Reference Handbook</i>
FM 3-9	<i>Military Chemistry and Chemical Compounds (AFR 355-7)</i>
FM 3-10	<i>Employment of Chemical Agents (NWIP 36-2, AFM 355-4, FMFM 11-3) (being revised as FM 3-10-1 and FM 3-10-2)</i>
FM 3-12	<i>Operational Aspects of Radiological Defense (FMFM 11-5)</i>
FM 3-15	<i>Nuclear Accident Contamination Control</i>
FM 3-21	<i>Chemical Accident Contamination Control</i>
FM 3-22	<i>Fallout Prediction (being revised as part of FM 3-12)</i>
FM 3-54E/CM	<i>Commander's Manual for Chemical Operations Specialist</i>
FM 3-54E1/2	<i>Soldier's Manual for MOS 54E, Chemical Operations Specialist, Skill Levels 1 and 2</i>
FM 3-54E3	<i>Soldier's Manual for MOS 54E, Chemical Operations Specialist, Skill Level 3</i>
FM 3-54E4	<i>Soldier's Manual for MOS 54E, Chemical Operations Specialist, Skill Level 4</i>

FM 5-15	<i>Field Fortifications</i>
FM 5-20	<i>Camouflage</i>
FM 7-30	<i>The Infantry Brigades</i>
FM 8-9	<i>NATO Handbook on the Medical Aspects of NBC Defensive Operations, AMED P-6 (NAVMED P-5059; AFP 161-3)</i>
FM 11-50	<i>Combat Communication within the Division (How To Fight)</i>
FM 17-95	<i>Cavalry (How To Fight)</i>
FM 21-6	<i>How to Prepare and Conduct Military Training</i>
FM 21-10	<i>Field Hygiene and Sanitation (AFM 161-10)</i>
FM 21-11	<i>First Aid for Soldiers</i>
FM 21-26	<i>Map Reading</i>
FM 21-30	<i>Military Symbols</i>
FM 21-40	<i>NBC Defense</i>
FM 21-48	<i>Planning and Conducting Chemical, Biological, Radiological (CBR), and Nuclear Defense Training</i>
FM 21-60	<i>Visual Signals</i>
FM 21-305	<i>Manual for the Wheeled Vehicle Driver</i>
FM 22-100	<i>Military Leadership</i>
FM 23-9	<i>M16A1 Rifle and Rifle Marksmanship</i>
FM 23-31	<i>40-mm Grenade Launchers, M203 and M79</i>
FM23-67	<i>Machinegun, 7.62mm, M60</i>
FM 24-1	<i>Combat Communications (How to Fight)</i>
FM 24-18	<i>Field Radio Techniques</i>
FM 27-10	<i>The Law of Land Warfare</i>
FM 30-5	<i>Combat Intelligence</i>
FM 30-16	<i>Technical Intelligence</i>
FM 30-102	<i>Opposing Forces: Europe</i>

FM 90-2	<i>Tactical Deception (How To Fight)</i>
FM 90-3	<i>Desert Operations (How To Fight)</i>
*FM 90-5	<i>Jungle Operations (How To Fight)</i>
*FM 90-6	<i>Mountain Operations (How To Fight)</i>
FM 90-10	<i>Military Operations on Urbanized Terrain (How To Fight)</i>
*FM 90-11	<i>Northern Operations (How To Fight)</i>
FM 100-5	<i>Operations (How To Fight)</i>
FM 100-50	<i>Operations for Nuclear-Capable Units</i>
FM 101-31-1	<i>Staff Officers' Field Manual: Nuclear Weapons Employment Doctrine and Procedures (FMFM 11-4)</i>
FM 101-31-2	<i>Staff Officers' Field Manual: Nuclear Weapons Employment Effects Data (U) (FMFM 11-4A)</i>
FM 101-31-3	<i>Staff Officers' Field Manual: Nuclear Weapons Employment Effects Data (FMFM 11-4B)</i>
FM 101-40	<i>Armed Forces Doctrine for Chemical Warfare and Biological Weapons Defense</i>

TECHNICAL MANUALS (TM)

TM 3-216	<i>Technical Aspects of Biological Defense</i>
TM 3-220	<i>Chemical, Biological, and Radiological (CBR) Decontamination (being revised as FM 3-5)</i>
TM 3-221	<i>Field CBR Collective Protection (being revised as FM 3-4)</i>
TM 3-4230-204-12&P	<i>Operator, Organizational, Maintenance Manual (Including Repair Parts and Special Tools List): Decontaminating Apparatus, Portable, DS2 1 1/2 Quart, ABC-M11 (NSN 4230-00-720-1618)</i>

*To be published

TM 3-4230-209-12	<i>Operator's and Organizational Maintenance Manual: Decontamination Apparatus, Power-Driven, Skid-Mounted, Multipurpose, Nonintegral, 500-gallon, ABC-M12A1</i>
TM 3-4230-213-10	<i>Operator's Manual: Decontamination Kit, Skin: M258</i>
TM 3-4240-279-10	<i>Operator's Manual, Mask, Chemical-Biological: Field ABC-M17/M17A1 and Accessories</i>
TM 3-4410-201-12	<i>Operator's and Organizational Maintenance Manual: Heater, Water, Liquid Fuel, Skid-Mounted, 600 gph, M2</i>
TM 3-6665-225-12	<i>Operator's and Organizational Maintenance Manual: Alarm, Chemical Agent, Automatic, Portable, Manpack, M8; Portable, Fixed Emplacement, M10; Portable, for Truck, Utility, 1/4-ton, M11; Portable, for Truck, 3/4-ton, M12; Portable, for Truck, 2 1/2-ton, M13; Portable, for Full-Track Armored Personnel Carriers and Recovery Vehicles, M14; Portable, for Carrier, Command and Reconnaissance Armored, M15; Portable, with Power Supply for Truck, Utility, 1/4-ton, M16; and Portable, with Power Supply for Truck, 2 1/2-ton, M18</i>
TM 3-6665-254-12	<i>Operator and Organizational Maintenance Manual: Detector Kit, Chemical Agent, M18A2</i>
TM 3-6665-268-10	<i>Operator's Manual: Sampling Kit, CBR Agent: M34</i>
TM 5-315	<i>Firefighting and Rescue Procedures in Theaters of Operation</i>
TM 9-1300-206	<i>Ammunition and Explosives Standards</i>
TM 10-277	<i>Protective Clothing-Chemical Operations</i>
TM 11-6665-209-15	<i>Operator's, Organization, DS, GS, and Depot Maintenance Manual, Including Repair Parts and Special Tools Lists: Radiac Sets, AN/PDR-27J, AN/PDR-27L, and AN/PDR-27Q</i>

TM 11-6665-214-10

Operator's Manual: Radiacmeters, IM-9E/PD, IM-93/UD, IM-93A/UD, and IM-147/PD

TM 11-6665-221-15

Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts Lists: Radiac Set AN/PDR-60

TM 750-5-15

*Army Equipment Data Sheet: Chemical Weapon and Defense Equipment***DEPARTMENT OF THE ARMY**
PAMPHLETS (DA PAM)

DA Pam 310-1

Index of Administrative Publications

DA Pam 310-3

Index of Doctrinal, Training, and Organizational Publications

DA Pam 310-4

*Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders***COMMON TABLES OF ALLOWANCE (CTA)**

CTA 50-900

Clothing and Individual Equipment (Active Army, Reserve Components, and DA Civilian Employees)

CTA 50-970

*Expendable Items (Except: Medical, Class V, Repair Parts, and Heraldic Items)***TECHNICAL BULLETINS (TB)**

TB SIG 226-8

Charges, Radiac Detector, PP-1578/PD and PP-1578A/PD

TB 385-2

*Nuclear Weapons Firefighting Procedures***STANDARDIZATION AGREEMENTS (STANAG)**

STANAG 2002

Marking of Contaminated or Dangerous Land Areas

STANAG 2047

Emergency Alarms for Hazard or Attack

STANAG 2079	<i>Rear Area Security and Rear Area Damage Control</i>
STANAG 2103	<i>Reporting Nuclear Detonation, Radioactive Fallout, and Biological and Chemical Attacks</i>
STANAG 2104	<i>Friendly Nuclear Strike Warning to Armed Forces Operating on Land</i>
STANAG 2112	<i>Radiological Survey</i>
STANAG 2133	<i>Vulnerability Assessment of Chemical and Biological Hazards</i>
STANAG 2150	<i>NATO Standards of Proficiency for NBC Defense</i>

ARMY TRAINING AND EVALUATION PROGRAMS (ARTEP)

ARTEP 3-87	<i>NBC Defense Company</i>
ARTEP 3-500-1	<i>NBC Reconnaissance Detachment (LA)</i>
ARTEP 3-500-2	<i>NBC Decontamination Detachment (FA/FB)</i>
ARTEP 3-500-3	<i>NBC Element (JA/JB)</i>

TABLES OF ORGANIZATION AND EQUIPMENT (TOE)

TOE 3-87	<i>NBC Defense Company</i>
TOE 3-500	<i>Chemical Service Organization</i>
TOE 3-937T	<i>NBC Defense Company (Restructured Division)</i>

TRAINING CIRCULARS (TC)

TC 3-1	<i>How to Conduct NBC Defense Training</i>
TC 3-3	<i>How to Use the Automatic Chemical Agent Alarm</i>

APPENDIX B

PERSONNEL DECONTAMINATION STATION REQUIREMENTS

The following items are needed to set up a personnel decontamination station (PDS). Normally, decontamination units cannot carry all of these items. Therefore, decontamination unit commanders must check to see how much equipment the contaminated unit can supply.

ITEM	PURPOSE
Decontaminating Agent, Super Tropical Bleach (STB): 600 lb NSN 6850-00-297-6653 Unit of issue: drum, 8 gal, 50 lb per drum	Used in the decontamination pit and for personal gear decontamination.
Soap, Laundry Bar: 60 lb NSN 7930-00-965-4868 Unit of issue: box, 60 1-lb bars per box	Used to make hot, soapy water for boots, mask, and hood decontamination.
Soap, Toilet: 72 lb NSN 8520-00-129-0803 Unit of issue: box, 72 4-oz bars per box	Used in showering.
Towel, Bath, 20 in by 40 in: 300 NSN 7210-00-823-7639 Unit of issue: dozen, 12 dozen per box	Used after showering.
Bags, Polyethylene 36 in by 54 in, 5 mils thick: 300 NSN 8105-00-848-9631 Unit of issue: box, 50 per box	Used for the removal of contaminated and soiled garments.

ITEM	PURPOSE
Can, Trash, Polyethylene, 32 in by 24 in, 44 gal: 16 NSN 7240-00-139-7521 Unit of issue: each, 4 per stack	Used to hold polyethylene bags and to hold slurry for decontaminating personal gear.
Can, Ash, Garbage, 32 gal Galvanized: 2 NSN 7240-00-160-0440 Unit of issue: each, 3 per stack	Used to heat water for cleaning boots, mask, and hood.
Brush, Chassis and Running Gear, Long Handled, 19 in: 24 NSN 7920-00-255-7536 Unit of issue: each, 12 per box	Used to decontaminate boots.
Heater, Immersion, Liquid Fuel Fired: 2 NSN 4540-00-266-6835 Unit of issue: each, 635 lb per heater and masks	Used to heat water for the decontamination of boots, masks, and hood.
Heater, Space, Radiant Type, Liquid Fuel: 4 NSN 4520-00-927-4214 (45,000 BTU per hr) Unit of issue: each	Used to heat shower area in cold climates.
Tent, General Purpose, Medium, 32 ft 8 in by 16 ft: 2 NSN 8340-00-543-7788 Unit of issue: each, 334 lb; poles and pins 200 lb	Used to cover shower area if buildings are not available.
Tarpaulin, 16 ft by 16 ft, 72 to 75 oz per yd: 4 NSN 8340-00-817-2126 Unit of issue: each, approximately 74 lb	Used to cover undressing line if buildings are not available.

ITEM	PURPOSE
Rope, Manila, 1/2 in, 3 strands: 600 ft NSN 4020-00-289-8615 Unit of issue: coil, 600 ft	Used as guy lines for tarpaulin tie downs on vehicles with loads.
Clothing, Protective: 300 changes NSN: Not Applicable (NA) Unit of issue: set, (trouser, liner, shirt, gloves, socks)	Used for the replacement of worn protective clothing.
Duck Boards: 75 linear fit NSN: NA Unit of issue: NA, improvised	Used as walkways in shower.
Benches: 40 linear ft NSN: NA Unit of issue: NA, improvised	Used as seats for undressing procedure.
Shower Assembly from M12A1 PDDA: 2 sets	Used as shower apparatus.
Contamination Markers: NSN: NA Unit of issue: NA, unit prepared	Used to mark contaminated areas.
Heater, Water, Liquid Fuel, 575 lb: 2 NSN 4410-00-542-5656 Unit of issue: each	Used to heat water in decontamination apparatuses.

ITEM	PURPOSE
Pump, Skid Mounted, 1,120 lb: 2 NSN 4230-00-902-3225 Unit of issue: each	Used as water pump for showers.
Gasoline: 40 gal	Used as fuel for pump and heater.
Automatic Chemical Agent Alarm: 3	Used as a warning against chemical attack.

APPENDIX C

Equipment Decontamination Station Requirements

The following items are needed to set up an equipment decontamination station (EDS). Usually, decontamination units cannot carry all these items. Therefore, decontamination unit commanders must check to see how much equipment the contaminated unit can supply.

ITEM	PURPOSE
Decontaminating Apparatus ABC M12A1: 2 (one with and one without tank unit) NSN 4230-00-926-9488 Unit of issue: each (includes tank unit, pump unit, and M2 600 GPH water heater)	Used to wash and rinse contaminated equipment.
Decontaminating Agent, Super Tropical Bleach (STB): 1,300 lb NSN 6850-00-297-6653 Unit of issue: drum, 50 lb	Used in decontamination pit and used to decontaminate rubber on vehicles.
Soap, Laundry Bar: 180 lb NSN 7930-00-965-4868 Unit of issue: box, 60 lb per box	Used to make hot, soapy water for decontamination apparatus.
Brush, Scrub, Deck: 48 NSN 7920-00-240-7171 Unit of issue: each, 24 per box	Used to scrub vehicles with hot, soapy water. Used to apply DS2 and STB slurry on rubber and canvas.
Handle, Scrub, Brush, Deck: 48 NSN 7920-00-141-5452 Unit of issue: each	Used as extension for brush.

ITEM	PURPOSE
Decontaminating Agent, DS2: 50 gal NSN 6850-00-753-4870 Unit of issue: 5-gal drum	Used to decontaminate equipment and metal surfaces.
Antisetting Compound, Decontaminating Slurry, M2: 50 lb NSN 6850-00-656-0926 Unit of issue: can, 4 cans per box	Used to prepare slurry for the decontamination of rubber and canvas.

APPENDIX D

**Special Nuclear, Biological, and
Chemical (NBC) Environments**

INTRODUCTION

Although the US Army is primarily organized for defense of NATO, it is entirely possible that it may find itself committed to battle elsewhere. This means that the Army must be trained to fight in other environments.

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**OPERATIONAL
ENVIRONMENTS**

Environments that have a major influence on conduct of military operations are—

- Mountains
- Jungles
- Deserts
- Cold weather regions
- Urbanized areas

Each of these environments has a different influence on NBC reconnaissance and decontamination operations.

**NATURAL DECONTAMINATION
OCCURS AT A FASTER RATE IN
MOUNTAINOUS AREAS**

MOUNTAIN OPERATIONS

Excluding the extremely high, alpine-type mountains, most mountain systems are characterized by—

- Heavy woods or jungle.
- Compartments and ridge systems.
- Limited routes of communication, usually of poor quality.
- Highly variable weather conditions.

NBC reconnaissance and decontamination units operate with attached elements or in direct support of brigade-size units. Since mountain operations are decentralized, NBC decontamination and reconnaissance leaders usually operate independently or semi-independently of their parent units. Additional water carrying vehicles may be required to support these operations.

Chemical and biological decontamination is easier to handle in mountain operations. Changing weather conditions and constant winds promote natural decontamination at a much faster rate than in flat or rolling terrain. NBC reconnaissance units concentrate on low terrain for nonpersistent chemicals and on prominent terrain features for radiological hotspots produced by fallout.

JUNGLE OPERATIONS

The jungles of Asia, Africa, and the Western Hemisphere are potential battlefields. Jungle terrain is characterized by—

- Heavy vegetation, varying from rain forest to savanna.
- Constant high temperatures.
- Heavy rainfall during certain seasons.
- Constant high humidity.

As in mountain operations, NBC jungle operations are decentralized as much as possible. Decontamination and reconnaissance elements may be placed in direct support of battalion task forces.

Requirements for complete personnel decontamination increase in jungle environments. Soldiers are unable to wear protective clothing for long periods of time. Heat stress is a major factor. Therefore, *many combined personnel and equipment decontamination operations are necessary to reduce heat load and to operate equipment without sustaining NBC casualties.* Reduction in mission oriented protective posture (MOPP) is scheduled at brief intervals since chemical agents are more persistent and effective in jungle environments. Because of these things, it is extremely difficult to maintain NBC reconnaissance and decontamination operations. Solid decontaminants, such as super tropical bleach (STB), tend to cake and

decompose at a faster rate than in temperate climates. Although caking of the decontaminant does not affect the usefulness of the compound, decomposition eventually makes it ineffective.

Operation of personnel and equipment decontamination stations, or any other activity requiring full NBC protection, may call for relatively short periods of operation, followed by relatively long periods of rest due to heat. Relocation of a decontamination unit may require support of a small security force to assist in the event of ambush. Decontamination stations are lucrative targets under normal conditions, but decontamination stations operating in jungle combat are even more vulnerable to enemy attacks.

DESERT OPERATIONS

Deserts are semiarid and arid regions containing a variety of soils in varying relief. Desert regions are characterized by—

- **Extreme temperature ranges, varying between 30°F (-1°C) and 130°F (54°C) over a 24-hour period.**
- **Changing visibility conditions.**
- **Long periods of drought, interrupted by sudden rains that bring flash floods.**
- **Shortages of suitable ground water.**
- **Large areas of excellent trafficability, interdispersed by ravines, bogs, and sand seas.**
- **An absence of pronounced terrain features.**

The principal problem of NBC reconnaissance and decontamination units in desert operations is lack of water. For example, without an outside water source, a decontamination unit can operate a personnel decontamination station (PDS) for only 18 minutes. If the unit has a filled 3,000-

gallon collapsible tank, it can operate for an additional 120 minutes. A decontamination unit with a 1,000-gallon water truck can operate for another 50 minutes. Although decontamination units normally operate as far forward as possible, available water supplies may force decontamination stations to operate further to the rear than normal.

Camouflage is another problem in desert operations. Lack of vegetation requires extensive use of camouflage nets, patterns, and mud paintings; covering of reflective surfaces; and smoke to conceal the decontamination station.

Heat stress is also a critical problem for soldiers working in desert environments under complete NBC protection. Operation of decontamination stations in daytime temperatures means short periods of work followed by long periods of rest. Operation at night, to avoid heat stress, creates light discipline problems which may be unacceptable, considering how easy it is to see in desert regions. In desert combat, much greater reliance is placed on decontamination using DS2. Therefore, resupply rates must be increased.

**DECONTAMINATION AND
RECONNAISSANCE OPERATIONS
ARE EXTREMELY DIFFICULT IN
COLD WEATHER AREAS**

COLD WEATHER OPERATIONS

Northern regions, including the Arctic and sub-Arctic, comprise about 45 percent of the North American continent and 65 percent of the Eurasian land mass. Northern regions are characterized by—

- **Extreme cold and deep snow during winter months.**
- **Spring breakup, resulting in poor trafficability.**
- **Whiteout and greyout which cause loss of depth perception, making flying, driving, and skiing hazardous.**
- **Ice fog in which clouds of ice crystals cover troops, vehicles, bivouac areas, and permanent facilities, marking their location.**

When temperatures go below 32°F (0°C), decontamination and reconnaissance elements have difficulty operating and maintaining their equipment. The decontamination truck operates effectively for personnel decontamination purposes at temperatures well below the freezing point. Constant winterization and use of the M2 water heater are required to prevent freezing. Winterization, however, is not always feasible. Decontamination units may have to deploy with empty tanks instead of with full ones as in temperate climates. Ground water in midwinter must be pumped from beneath an ice layer. To prevent freezing, it may be necessary to preheat the water during loading and keep it heated until it is used.

The PDS needs heated undressing, showering, and dressing facilities. Tents, normally used for such operations, may not provide enough shelter in extremely cold conditions. Commanders may find it necessary to set up a semipermanent PDS. In addition, equipment decontamination may not be effective if the temperature reaches -15°F (-26°C). At this point, DS2 is no longer effective against chemical agents.

Toxic chemicals also react differently at extremely low temperatures. For example, at

32°F (0°C), blister agents such as distilled mustard, phosgene oxime, and mustard-lewisite mixture become solids. As the temperature drops to -15°F (-26°C), two blood agents (hydrogen cyanide and cyanogen chloride), and three blister agents (HN-3, L, and PD) become solids. At -70°F (-57°C), only four toxic chemicals remain in liquid form (CG, SA, HN-2, and ED). All of the remaining agents become solids, including nerve agents.

Munitions containing normally persistent agents become very persistent at low temperatures. If a soldier gets a solid agent on his clothing, he will probably not detect it since it has no effect in solid form. However, *if the temperature warms or if a contaminated soldier enters a heated area, the agent becomes dangerous.* Because of this, it may be necessary for each PDS to set up a

preundressing station to warm soldiers sufficiently to detect the presence of a solid agent. The solid agent must be isolated before the soldier reaches the shower area where he un.masks. Additional soldiers and equipment are needed for this step. In cold weather operations, the priority of decontamination and detection efforts is given to heated support facilities.

NBC reconnaissance is adversely affected by extreme cold. Electronic instruments, such as radiacmeters and automatic chemical agent alarms, become less dependable and may even fail. Chemical detection and identification kits cannot detect solid agents. It may be necessary to take soil, snow, or vegetation samples from suspicious areas and warm them to detect and identify chemical vapors.

URBANIZED AREA OPERATIONS

Urbanized areas will have a significant affect on military operations in the future. Today, it is difficult to avoid built-up areas, particularly in Western Europe. Urbanized terrain is characterized by—

- Villages (population of 1,000 or less).
- Towns and small cities which are not part of a large-urban complex (population in excess of 1,000 but less than 100,000).
- Strip areas which connect villages and towns along roads and valleys.
- Large cities with associated urban sprawl (population in excess of 100,000 and covering 100 or more square miles).

NBC reconnaissance and decontamination operations are easy to support in urbanized terrain. Water sources for decontamination operations are virtually assured in built-up areas. Security is simplified by limited

observation and poor fields of fire. However, reconnaissance elements do face one potential problem. Chemical agents tend to act differently in built-up areas. Low-lying areas tend to collect residual chemical contamination. Some nonpersistent agents become relatively persistent when released, causing them to enter buildings or rubble. NBC reconnaissance units must pay particular attention to this problem so that contaminated areas are avoided and marked whenever possible.

When buildings are contaminated with persistent chemical agents, their value for cover, concealment, and shelter is reduced. Wood and concrete tend to absorb liquid agents and may give off toxic vapors for days or weeks. Chemical decontamination of a building requires large quantities of decontaminants and considerable effort. Building contamination can be reduced by covering contaminated areas with plastic sheets, STB slurry, sodium silicate (water glass), or some substance that covers or absorbs the agent. Streets and sidewalks also absorb liquid

agents, then give off toxic vapors when heated by the Sun. It may be necessary to decontaminate such surfaces several times to reduce toxic hazard to soldiers occupying the area.

Biological agents may remain viable for long periods in built-up areas. *Soldiers should not occupy structures that are contaminated*

with biological agents. Decontamination of biologically contaminated structures is beyond the ability of NBC decontamination units. If it is necessary to occupy a biologically contaminated area, buildings and their contents should be burned. Soldiers should remain upwind of the fire. Otherwise, they should remain masked and observe the precautions in FM 21-40.

APPENDIX E

Clothing Exchange and Bath Operations

INTRODUCTION

When not faced with a nuclear, biological, and chemical (NBC) threat, decontamination units are used on an area support basis to provide clothing exchange and bath services. Each decontamination squad or team is capable of setting up and operating one clothing exchange and bath point. The brigade chemical officer works with the brigade and battalion S4s to determine where and when to set up the baths.

SITE SELECTION

The location must have an adequate supply of clean water. Dams, built on streams to form reservoirs, are usually suitable. Trucks must be able to get to the site. Also, the site should be near the troops it is to support. In addition, an adequate parking area must be provided. Natural cover and concealment for the installation is desirable, but camouflage nets may be used to conceal its location. The site should also be located on well-drained ground so that used bath water can be discharged into sumps.

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CLOTHING EXCHANGE AND BATH POINT

After setting up the bath, the decontamination unit leader—

- Regulates movement of personnel through the bath.
- Directs disposition of soiled clothing, equipment, and personal effects.
- Maintains a headcount and a bath status report.

Decontamination specialists issue clean clothing, receive soiled clothing, maintain issue and receipt records, and deliver soiled clothing to laundry facilities. The supported unit works with the brigade forward area support coordinator (FASCO) to insure delivery of fresh clothing and backhaul of soiled clothing.

The decontamination unit leader sets up the clothing exchange and bath point. Two medium general purpose tents are used for the operation. Troops undress in the first tent, shower in the second, and return again to the first to dry. They then receive clean clothing and dress.

THE OPERATIONAL STEPS FOR THE CLOTHING EXCHANGE AND BATH POINT ARE AS SHOWN

STEP 1 Soldiers enter the first tent. A decontamination specialist issues them a numbered, valuables bag and a metal claim disk on a chain or string. They put personal property into the valuables bag and undress. They also place the claim disk around their neck. Helmets are fastened to the valuables bag by the chin strap.

STEP 2 They put soiled clothing in bags, provided by the decontamination unit. A decontamination specialist supervises this step.

STEP 3 They give their boots and valuables bags to a decontamination specialist.

STEP 4 Soldiers pick up a bar of soap.

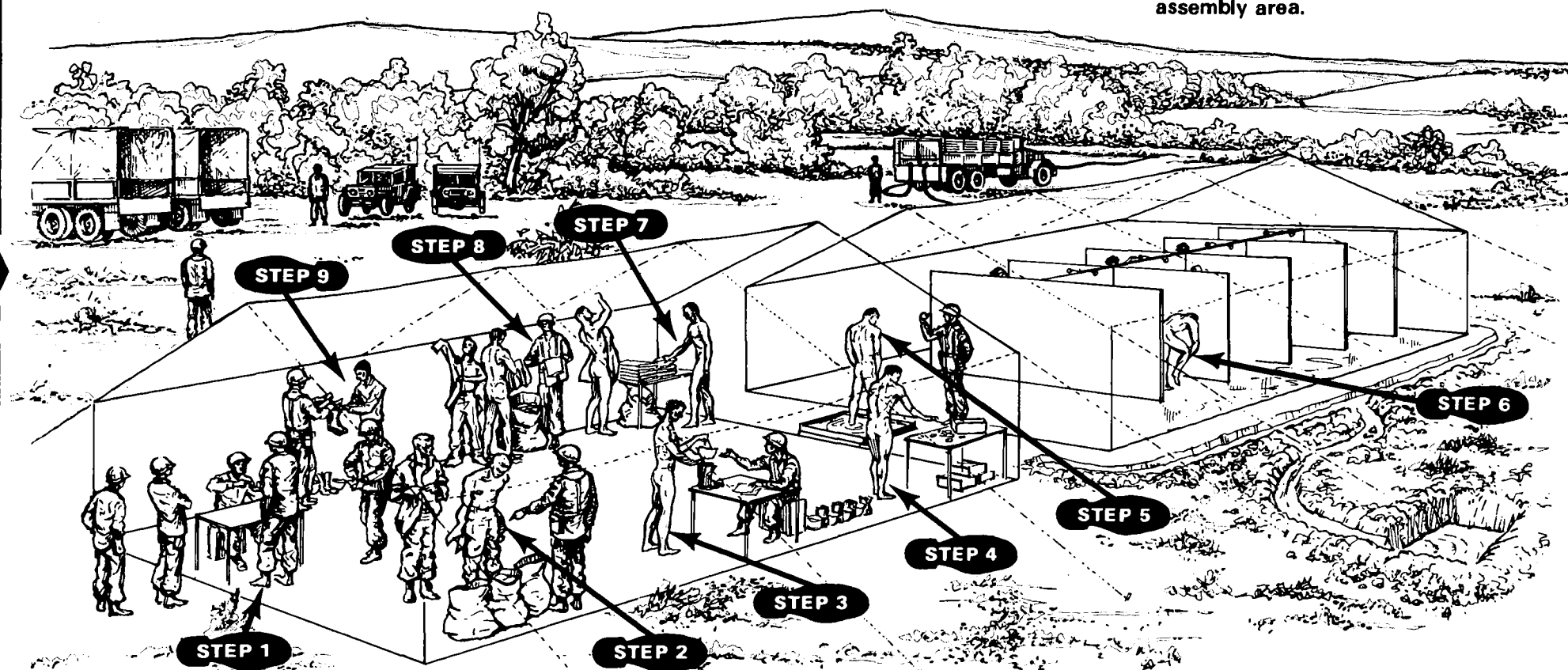
STEP 5 They soak their feet in a bath of sodium hypochlorite or chlorinated lime. The solution is prepared by adding one-half ounce of grade A (70%) calcium hypochlorite or two-thirds ounce of chlorinated lime (35%) to each 10 gallons of water.

STEP 6 They enter the shower tent and wash for about 7 minutes. If water supply is a problem, showering may be reduced to about 3 minutes. One decontamination specialist supervises this step while another operates the shower unit.

STEP 7 Soldiers return to the first tent, pick up a towel, and dry.

STEP 8 They obtain fresh clothing from a representative of their unit.

STEP 9 Soldiers dress, pick up their valuables, and return to the unit assembly area.



FM 3-87

22 FEBRUARY 1980

By the order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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